DOCUMENT RESUME

ED 323 346 CE 055 695

AUTHOR Tuijnman, Albert
TITLE Recurrent Education, Earnings, and Well-being. A Fifty-Year Longitudinal Study of a Cohort of Swedish Men. Stockholm Studies in Educational Psychology 24.
REPORT NO ISBN-91-22-01317-2
PUB DATE 89
NOTE 288p.; Doctoral Dissertation, University of Stockholm.
AVAILABLE FROM Almqvist and Wiksell International, P.O. Box 638, S-101 28 Stockholm, Sweden.
PUB TYPE Dissertations/Theses - Doctoral Dissertations (041)

EDRS PRICE MF01/PC12 Plus Postage.
DESCRIPTORS Adult Education; *Career Development; *Continuing Education; *Educational Attainment; Educational Mobility; *Education Work Relationship; Employment Level; Income; Lifelong Learning; Longitudinal Studies; Males; *Outcomes of Education; Participation; Path Analysis; Predictor Variables; Socioeconomic Status; *Success
IDENTIFIERS *Sweden

ABSTRACT

A study investigated the contribution of adult education in complementing and mediating the effects of early formal schooling on life chances, job satisfaction, and general well-being. Data collected for the cohort of Swedish men followed up in the Malmo study from 1938 to 1988 were examined. The study used measures of home background, disposition to learn in the classroom, cognitive ability assessed in childhood and early adulthood, youth educational attainment, and indicators of occupational status, earned income, job satisfaction, and well-being measured during the early, middle, and late stages of life career. Measures of participation in adult education were available from 30 to 56 years of age. Path models were investigated using linear structural relations analysis. The findings indicate that: (1) youth education influences participation in adult education at all ages; (2) early participation in adult education also influences adult participation during subsequent periods; (3) relative to the diminishing effects of youth education on occupational status after 30 years of age, the effects of adult education on occupational status increase with increasing age; and (4) the direct effects of youth education on earnings increase sharply from 25 to 40 years of age and diminish gradually thereafter. The study concludes that research that has used short-term indicators of the effects of adult education has underestimated the contribution of adult education because participants have not been followed up for a sufficient length of time. In general, participants in adult education regard their lives as more worthwhile, full, rich, and interesting than those who do not take part. (Over 270 references, 43 tables, and 23 figures are included.) (Author/CML)

ED323346

Acta Universitatis Stockholmiensis
Stockholm Studies in Educational Psychology
24

Albert Tuijnman

Recurrent Education, Earnings, and Well-being

A Fifty-Year Longitudinal Study of a Cohort of Swedish Men

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Recurrent Education, Earnings, and Well-being

A Fifty-Year Longitudinal Study of a Cohort of Swedish Men

Albert Tuijnman

Recurrent Education, Earnings, and Well-being

A Fifty-Year Longitudinal Study of a Cohort of Swedish Men

Almqvist & Wiksell International
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Abstract

This study investigates the contribution of adult education in complementing and mediating the effects of early formal schooling on life chances, job satisfaction and general well-being. Data collected for the cohort of Swedish men followed up in the Malmö Study from 1938 to 1988 have been examined.

The study employs measures of home background, disposition to learn in the classroom, cognitive ability assessed in childhood and early adulthood, youth educational attainment and indicators of occupational status, earned income, job satisfaction and well-being measured during the early, middle and late stages of life career. Measures of participation in adult education are available from 30 to 56 years of age.

The approach taken in the examination of the effects of both youth education and adult education has been to develop and estimate path models by means of which these effects can be assessed, using linear structural relations (LISREL) analysis. Several models have been investigated, namely: (1) a model predicting youth education, (2) a model predicting adult education, (3) a model predicting occupational status and earnings, and (4) a model predicting job satisfaction and well-being.

The findings indicate that youth education influences participation in adult education at all ages. Early participation in adult education also influences participation during subsequent periods. Relative to the diminishing effects of youth education on occupational status after 30 years of age, the effects of adult education on occupational status increase with increasing age.

The direct effects of youth education on earnings increase sharply from 25 to 40 years of age and diminish gradually thereafter. As the direct effects of adult education on occupational status increase over time, the total effects of the former on earnings mediated by occupational status also increase with age. It is concluded that studies investigating the effects of adult education using short-term indicators of program impact have underestimated the contribution of adult education, because participants have not been followed up over a sufficiently long period of time.

The direct effects of adult education on subsequent job satisfaction are not significant. However, a weak total effect is found mediated by occupational status and prospects for career development. In general, participants in adult education regard their lives as more worthwhile, full, rich and interesting than those who do not take part.

Descriptors: adult education, education work relationship, educational mobility, income, lifelong learning, longitudinal studies, outcomes of education, path analysis, Sweden.

ISBN 91-22-01317-2

ISSN 0562-1089

Typography: Manfred Sonnenberg

Printed in Sweden by
Graphic Systems, Stockholm 1989

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Acknowledgements

The investigation reported in this book builds on data collected in Sweden from 1937–38 to 1988 for the longitudinal Malmö Study. In 1938, Siver Hallgren administered a group intelligence test to the entire third-grade school population in Malmö, Sweden's third largest city. In order to study how cognitive ability assessed at 10 years of age was related to environmental factors, Hallgren had gathered empirical information concerning the students' home background during the autumn of 1937. In 1948, Torsten Husén initiated a study on the predictive value of cognitive ability test results. Not only were intelligence test scores obtained for most boys, but data concerning their educational and occupational careers until 20 years of age were also collected. Torsten Husén, Ingemar Fägerlind and Ingemar Emanuelsson planned and performed the subsequent data collection, which took place in 1963. Since 1971, Ingemar Fägerlind has been responsible for keeping the Malmö Study alive. It follows from the above that the present investigation should not be looked upon as the product of a single person but rather as that of the people who have worked with the Malmö Study during the fifty years it took to collect the data. To all whose dedicated efforts have made this research possible, my heartfelt thanks.

I am much indebted to Professor Ingemar Fägerlind, my supervisor, who has encouraged me to undertake this study and who has generously provided me with a part of the original data collected in the Malmö Study. He has also given much impetus to my work, not least with regard to his influence on my approach to the problems investigated. I am deeply grateful to Professor Torsten Husén for his guidance and constant readiness to discuss problems connected with the study. He has remarkably stimulated my interest in recurrent education – and numerous other areas of social and educational research besides. I wish to express my very sincere gratitude to Professor John P. Keeves, whose help and patient teaching at all stages of the study have been priceless. He has carefully read and commented upon the manuscript in all its versions, thus sharing his understanding of research methods, and making numerous valuable suggestions for improvement along the way. I wish also to thank Professor Sixten Marklund, who often has given up

his time to supply me with views on and information about the Swedish system of education. Thanks are due also to Professor Karl G. Jöreskog and Professor Dag Sörbom, who generously provided me with a copy of the LISREL 7 computer program for linear structural relations analysis.

There are many other people who have aided and supported the study. I want especially to thank Dr. Wendy Duncan, who expertly corrected my English and at the same time gave many helpful comments, and Dr. Anton Johnston, who read parts of the manuscript and contributed with useful criticism. Thanks are also due to members of the Malmö Study research team, and particularly, to Mrs. Görel Strömqvist, Mrs. Zenia Hellström and Dr. Margareta Furu who, at different times and in different ways, have been instrumental in the collection, coding and processing of the data analyzed here. I also thank my colleagues at the Institute of International Education, to whom I am deeply indebted for their help and advice on many occasions. Thanks are also due to Mr. Jan-Hendrik van den Born, who drew the figures.

The research project reported in this monograph was made possible by generous funding from the Swedish National Board of Education, by grants to the Malmö Study from the Swedish Council for the Planning and Coordination of Research, and by financial support received from the Bank of Sweden Tercentenary Fund. As the cost of collecting and analyzing longitudinal data is often inhibitive, and as such research tends to be comparatively slow in producing results, it is usually very difficult to obtain sufficient funding for longitudinal studies spanning over many years. Yet, without such data sets, many aspects of human development and change cannot be appropriately investigated. I sincerely thank the Swedish authorities who, by supporting the Malmö Study since the late 1940s, have made an important contribution to educational and social research.

However, most of all I am indebted to my dear family, Hendrika, who married me when I began to write this monograph, and Teodor, who was born about six months before it was completed. This book is dedicated to them.

Albert Tuijnman
Stockholm, August 1989

Chapter 1
Recurrent Education in Question

The Problem in Context

In the late 1960s the idea of recurrent education was launched as a panacea for real or anticipated problems arising in the expansion of formal education and the needs of the labour market in industrial societies. Mainly because of the high costs involved, disillusionment with recurrent education had become widespread by the late 1970s and early 1980s. Since that time, however, recurrent education has gained endorsement from governments, not least as a result of pressures brought to bear on politicians by employers and worker collectives.

Scholarly writing in the field of the economics of education abounds with prescriptive-arguments in support of the expansion of formal adult education and the improvement of opportunities for in-service training and broad human resource development in working life (e.g. Husén, 1969; OECD, 1973; Levin and Schütze, 1983; Coombs, 1985; OECD, 1985). For example, it is claimed that the efficiency of producing goods and services is enhanced by education and training received in adult life, particularly in societies facing a situation of accelerating technological development (Bengtsson, 1985; OECD, 1987a). The guiding premise is that, as technology, production systems and organizational structures become more complicated, there will be a need for an increasing emphasis on training designed to augment experiences of education and work. The assumption is that a well-trained workforce, a competent managerial force, labour collectives and technical expertise which are receptive to change, are important elements in determining the speed and success of implementing new technology and adapting work organizations to changing social and economic demands (Alfthan, 1985). A related assumption is that technological innovations are bound to have repercussions not only on the number and kind of jobs available, but also on the content and organization of work. These innovations will thus influence the skills, qualifications, adaptability and attitudes required of the workforce. In spite of the controversy over the skill implications of new technology, there seems to be a broad consen-

sus among politicians and social scientists about the role of recurrent education in a national strategy of development that attempts to influence the demand and supply of labour, to thwart excessive labour market segmentation, and to create jobs for the unemployed and career opportunities for currently low-paid and unskilled workers (Tuijnman, 1989a).

The perceived importance of both a need and capacity for learning and relearning in information- and technology-intensive societies has led decision-makers in OECD Member States to assume that the development of a coherent and structured system of education organized around a recurrent strategy is inevitable in the long run (OECD, 1985). An excellent example of a forceful statement about the need for more training and retraining in advanced industrial societies is found in a working paper issued recently by the OECD:

> There exists today widespread agreement that education and skill development among adults should no longer be considered as a "social cost" but as an economically useful investment in intangible resources without which other forms of investment in material resources will yield sub-optimal results. This interpretation holds true for both micro-economic processes at the level of enterprises and macro-economic development at the level of societies. (OECD, 1988, p. 11)

It follows from the above that the general premise underlying most studies in the economics of education is that education, usually in unspecified ways, has a desirable influence on economic performance--whether at the individual, organizational or the national economy level. In recent years, this supposition has been increasingly brought to bear on strategies of using recurrent or continuing education to improve the equity and efficiency of educational programs, to develop the competencies, skills and attitudes required of the labour force, and to prevent loss of employment. However, evidence for the validity of this common-sense assumption is difficult to establish. Despite the widely adhered to conviction that formal adult education and in-service training have significant effects on productivity and provide benefits in the form of economic stabilization, increased competitiveness, and augmented earnings, information about the nature and magnitude of these linkages is scanty.

Until fairly recently, most studies focussing on the social, occupational and economic benefits of education have dealt only with the effects of early formal education. Divergent theories and different methods of

statistical analysis have been used by research workers in examining the issue of the extent to which the level of formal education acquired by young people predicts observed differences in measures of life chances and well-being. Since the advent of path analysis techniques in the late 1960s and early 1970s an extensive body of research has been assembled with a focus on how social background and cognitive ability, by means of early formal education, become converted into life chances and career destinations (Fägerlind, 1975; Jencks *et al.*, 1979; Boissiere *et al.*, 1985; Bound *et al.*, 1986). However good such research may have been in partialling out the influences of early formal educational attainment, it is beset by at least one important limitation.

Most industrial societies have recently witnessed a great advance in recruitment to programs of adult recurrent education. Nowadays, as a result of increased participation in formal adult education and in-service training, large numbers of women and men in the workforce have subsequently been exposed to more or less systematic learning experiences in the years following their earlier exit from the formal system. These aspects of learning have generally not been taken into consideration in studies estimating the occupational and economic benefits of education. The failure to control for adult learning experiences must be considered to cast doubt on the findings of many studies which have investigated the job-related benefits of schooling and higher education (Tuijnman *et al.*, 1988). Hence, in estimating the effects of education on life chances, an analytic strategy is called for that is capable of separating the effects of early formal education from the possible influences of subsequent adult education.

If the claims generally mentioned in support of recurrent education are examined in terms of their significance for educational systems and labour markets, the implications are stupendous. Hence, it is important that systematic research be carried out to bring empirically-based arguments to bear on these issues. If common beliefs about the value of recurrent education for efficiency and performance in modern industrial societies are correct, then occupational and social mobility and augmented earnings should be identifiable among the observed outcomes of adult education and training. However, the findings so far obtained from econometric evaluations of training programs are inconclusive (Stoikov, 1975; LaLonde, 1986; Moffitt, 1987; Kalleberg and Lincoln, 1988). These tend to show that the logic of recurrent education is much more problematic than is generally acknowledged.

Thus, in the general clamour for increased provision of adult education, the philosophical and empirical underpinnings of such educational programs deserve careful scrutiny (Standing, 1988).

Furthermore, it should be noted that most programs of adult education have other goals, the nature and characteristics of which can neither be expressed nor assessed and interpreted in terms of conventional economic criteria. Because the purpose of adult recurrent education is not confined to one of conferring knowledge and skills for career mobility, the use of economic criteria in assessments of the outcomes of adult education is both incomplete and inadequate. Other goals and outcomes are also important. For example, adult education seeks to promote social, cultural and political participation as an end in itself and as a means for improving the welfare of people. It aims to increase the general ability and willingness of people, in their role as citizens, to become involved in and to influence the further development of society. Participation in adult education is also regarded as constituting a means for personal enrichment, self-fulfilment, and the development of leisure activities (Swedish Ministry of Education, 1988). Hence, because participation may well be motivated by subjective factors pertaining to people's perceptions of their nonmaterial conditions of living, research into the effects of recurrent education should not be restricted to the economic dimension of life. Not only is the equity aspect of participation in adult education important in this respect. The relationships between youth education and adult education, on the one hand, and indicators of job satisfaction and self-perceived well-being, on the other hand, must also be studied.

Aims of the Study

The purpose of this study is to investigate the role of adult recurrent education in complementing or mediating the effects of early formal education on the life chances and perceived well-being of a cohort of Swedish men born around the year 1928. The analytic strategy used in this monograph to achieve this end is to develop path models in which the influences of both early formal education and adult recurrent education on life chances and well-being can be assessed. In estimating these structural equation models, the study seeks to address four questions of central concern to both research workers and policy-makers in the field of education.

First, to what extent do youth education and adult recurrent education predict occupational status, earnings, and well-being? And how do these influences compare with one another during different stages in the life career? Second, to what extent does adult education augment, mediate or diminish the role of youth education as an important stratifier in a modern society? Third, is there a significant relationship between participation in human resource development programs connected with the operations of the workplace and people's perceived job satisfaction? Four, do those who take part in programs of general adult education and in-service training score, on average, higher on measures of perceived well-being than those who do not participate in such programs? In other words, do participants in adult education tend to see their lives as more "full," "worthwhile," "rich," and "interesting" than the general population?

Because the questions addressed in this monograph cover a wide research area and involve issues with pervading implications for both theory and practice in education, the approach taken is to subdivide the investigation into four components. Each of these focusses a specific research problem for which a path model is hypothesized and structural and measurement models are estimated by using data derived from the longitudinal *Malmö Study*. The issues dealt with are presented separately for each of the four research areas investigated.

1. *Youth Educational Attainment*

The aim is to estimate the effects of home background and measured cognitive ability on early educational attainment. Estimates of the relative influences of merit and social origins on youth educational attainment are needed because the study also aims to discover whether there are significant differences in the extent to which these antecedent factors influence the decision to take part in programs of adult recurrent education.

2. *Adult Recurrent Education*

The aims are, first, to measure the quality and amount of adult education cumulatively received by the 834 men followed in the longitudinal Malmö Study over a 25-year period; that is, from 30 to 56 years of age. Second, to identify and measure the factors influencing the likelihood of taking part in programs of adult education on a recurrent basis.

Third, to compare the relative strength of the influences of these antecedent factors on participation in adult education over time. Of particular interest is the question as to whether and to what extent adult recurrent education, by offsetting differences in youth educational attainment, has reduced the gap in early formal education between the initially poorly-educated and the relatively well-educated groups surveyed in the Malmö Study.

3. *Occupational Status and Earnings*

The aim is to estimate the net differential effects of early formal education and subsequent adult education in structural equation models of status attainment and structural maintenance from 25 to 56 years of age. The central question is one of finding out whether adult recurrent education has had a discernible positive influence on the life career outcomes of the men studied after variations in early formal education and cognitive ability levels in the population are held constant.

4. *Job Satisfaction and Perceived Well-being*

Apparently, many people take part in programs of adult education, not for the sake of career advancement, but with the aim of enhancing job satisfaction, developing leisure activities and improving, in some ways, their general life satisfaction and perceived well-being. Hence, an additional aim of this study is to investigate whether participation in adult education and workplace training is associated with job satisfaction and general well-being. If significant associations are found, the study aims to estimate the influences of participation in adult recurrent education on expressions of job satisfaction, on the one hand, and effects on perceived well-being in a more general sense, on the other.

Significance of the Study

As the review of previous research given in Chapter Four demonstrates, the rapidly increasing number of articles published in leading journals in the social sciences that address the issue of the influences of adult recurrent education on life career outcomes probably serves as an appropriate indicator of the relevance of the research questions ad-

dressed in this report. While research into the enduring effects of early formal education on particular outcome variables is generally beset by great difficulties (for example, see Wolfle, 1980 and 1987; and Härnqvist, 1989), this is particularly true of research into the causal influences of adult recurrent education. Evaluative research involving the outcomes of adult education is a complicated endeavour because the mostly voluntary programs of adult education cater for widely heterogeneous audiences and, hence, are generally characterized by a multitude of goals, organizational structures, curricula, pedagogical practices and, not least important, different kinds of certifications.

It is clear that training systems involve a complex pattern of factors. Hence, whether or not linkages exist between recurrent education, life chances and well-being, adequate allowance has probably not been made for other factors that could be implicated in the relationships between adult education, income and, in particular, perceived well-being. A related problem is that self-directed learning, recurrent education and training, and other experiences assumed to be of relevance to an individual's occupational qualifications, are often not directly observable, in part because a wide variety of activities might reasonably be considered job-relevant learning (Bowman, 1987a).

As a result of these and other problems of measurement and assessment, some central elements in the on-the-job training (OJT) hypothesis have, until fairly recently, been subjected almost exclusively to indirect analyses based on the age-earnings profiles of gainfully employed male workers. This approach has had the disadvantage that factors such as home background and cognitive ability have not been taken into consideration. Moreover, as Hanushek and Quigley have pointed out:

> On-the-job investments are quite commonly accepted as an important explanation for systematic variations in earnings over the life-cycle, but this acceptance has not come from detailed examinations of OJT activities themselves. Rather, it has come from a logically consistent conceptual framework based upon individual maximizing behavior, coupled with very indirect empirical support found in the concavity of age-earnings profiles. (Hanushek and Quigley, 1985, p. 381)

More precise estimation of the benefits of education in a system of recurrent education is a critical issue. However, the assessment of benefits is beset by many problems. As was implied by the preceding paragraphs, one difficulty concerns the definition of what constitutes

job-relevant learning. Another problem is how to use this definition in the development of appropriate indicators. Perhaps the greatest difficulty concerns the collection of data needed to measure these indicators. It is possible that stability or instability in the effects of both youth education and subsequent adult recurrent education will not become clearly discernible until some point in time late in the individual life career. Research into the occupational and economic benefits and psychological effects of adult education therefore probably requires a time perspective which covers the entire period from the conclusion of early schooling, initial university education or the point of labour market entrance, through all phases of adult life, until retirement age.

The research endeavour reported in this monograph is based on data collected longitudinally in the *Malmö Study* since 1938 for a cohort of men and women born in Sweden around 1928. With the exception of this data set, no prospective longitudinal study seems to be in existence in the world today that has traced a group of people for more than half a century. Moreover, even though there exist longitudinal studies in which panels have been repeatedly surveyed with the purpose of collecting data about the occupational careers of those traced and their income development over time, the Malmö Study is one of the very few longitudinal studies in which information about people's patterns of recurrent participation in programs of adult education, including their motives for undertaking further studies, has been systematically collected over a 25-year timespan. Hence, the data collected in the Malmö Study can be employed to estimate the long term effects of both early formal education and adult recurrent education on life career outcomes and well-being. Furthermore, it is important in this context to mention that the Swedish system of adult education is well-developed by international standards. A study estimating the possible effects of recurrent education involving longitudinal data gathered in Sweden could therefore be of interest even to an international audience.

Another problem confronting research workers investigating the effects of adult education concerns the factors which influence people to undertake such learning activities in adult life. It has been convincingly argued that the use of the enrolment status of participants as a sampling criterion casts serious doubt on the validity of the data set and, hence, on the value of research findings, since large but spurious influences of adult education can be found. Selection bias can occur if there are unobserved factors influencing the probability of recruitment to recur-

rent education which also correlate with unobserved antecedents of the criterion variables (Heckman, 1979; Kiefer, 1979; Laurence *et al.*, 1979; Willis and Sherwin, 1979). Unfortunately, nearly all studies into the effects of adult education and training programs undertaken so far have investigated participant populations only. As a consequence, these studies are likely to have suffered from variable sampling errors and specification errors resulting from selection bias.

The key to overcoming these problems is a data set representative of both participants and non-participants, containing valid indicators of program treatment on the one hand and measures of pre- and post-activity variables on the other. With the use of such indicators, the program treatment equation can, under certain conditions, be identified from the program performance or impact equation (Moffitt, 1987). Then, with the use of an analytical strategy for structural modelling such as the one developed by Jöreskog and Sörbom (1977; 1986 and 1988) in the LISREL 7 computer program for linear structural relations analysis, the influences of measurement errors and significant error covariances can be taken into account.

The Malmö Study and its data are uniquely suited for the analyses of data conducted in this monograph because its population was initially defined and surveyed at a time when most respondents were 10 years of age. Hence, initial selection bias is not present in the data set. Moreover, because different measures of adult recurrent education are available, it is possible in this study to employ the latent variable approach to the development of structural equation models, and to estimate parameters in these models which are by and large free from measurement error. Given the serious problems of analysis introduced in most longitudinal studies by error covariances and multicollinearity, and given the need to overcome specification errors, the LISREL 7 approach and the data gathered in the Malmö Study are highly appropriate for testing the models of adult recurrent education developed in this report.

As in most longitudinal studies covering a substantial period of time, the Malmö Study has encountered problems of analysis due to missing data and sample attrition. However, contrary to most studies, an attempt is made to estimate population effects due to missing data by employing an analytical strategy which, at least to a large extent, provides for variable errors and bias arising from systematic noncoverage and nonresponse. Hence, another asset of the approach taken in

this monograph is that methods for the estimation of causal models with missing data, which have become available during recent years, are built into the analysis. But, because of the highly technical nature of Chapters Six and Seven, in which the characteristics and consequences of missing data in the Malmö Study are investigated and methods for data compensation are developed and applied, some readers might wish to omit these chapters from their first reading.

Limitations of the Study

This study is based on the male segment only of the data collected in the Malmö Study. Previous research indicates that there are significant differences between women and men with respect to the types of programs attended and the reasons for participation. Hence the most serious limitation of this study is its failure to include models which are related to the career development and well-being of women.

Because the population initially surveyed in the Malmö Study comprises all students who, in 1938, attended the third grade of both public and private schools in Malmö, the relevance of the data set should also be considered. Malmö city is located in the midst of a densely populated and industrialized region on the southern coast of Sweden. Even though most Swedes reside in towns and cities, the urban character of the population studied should be noted. Another point of some concern is that, in recent years, research workers have paid increased attention to the issue of distinctive cohort experiences in the context of social, economic and demographic change, and have attempted to separate out age, cohort and period effects in research on the development and utilization of human resources (Bowman, 1987b; Riley, 1987). The findings of this expanding body of research are inconclusive. Yet the importance of experiences unique to a particular cohort is increasingly being recognized. Whether and how cohort effects influence the relationships studied in this report is unclear from previous research.

The possibility that the cohort traced in the Malmö Study could involve an exceptional case should be taken into account in making inferences which are relevant to any other population. For example, the population covered by the Malmö Study matured at a time when social policy in Sweden was characterized by poverty relief measures instead of comprehensive social welfare. At that time, the goal of democratic

equality had not yet resulted in the comprehensive school. Moreover, because the people followed in the Malmö Study were in their thirties and forties during the 1950s and 1960s, they may have had a high propensity to take part in programs of adult education at a time when opportunities for doing so were not as widely available, when recruitment generally was more restrictive, and when the private costs for education were probably higher than is the case today. The reforms of compulsory schooling and upper secondary education, the change of the university system, the subsequent development of formal adult education and, above all, the rapid expansion in recent years of in-service training and other human resource development programs in working life have important implications for the extent to which the findings reported from this study can be generalized.

However, these recognizable limitations do not negate the significance of this study for policy, research and practice in the field of education. It is worthwhile in this connection to acknowledge and emphasize two important aspects of this study. First, in the course of a 25-year period of experimenting and reforming, Sweden has come much closer than most other OECD Member States towards realizing the goal of establishing a system of education organized around a recurrent strategy. Because Sweden has been committed to recurrent education for a long time, it provides one of the best contexts in the world for examining the effects of recurrent education on the individual and society. Second, the longitudinal data set examined in this investigation is among the very few studies in existence in the world that can be utilized in tracing the enduring effects of both early formal educational attainment and adult recurrent education in a truly life span perspective.

Chapter 2
Recurrent Education: Concepts and Theories

Data about participation in adult education have been collected in the longitudinal Malmö Study from 1958 to 1984. The people traced in this investigation were around 30 years of age in 1958. Not only has the Swedish system of education changed drastically since that time, but the concept of recurrent education has also come into being. The complex interplay of factors involved in the general development of the Swedish system of education since the 1960s, especially with regard to the shaping of recurrent education policy, is described in the next chapter. The current chapter presents the theoretical background information needed for an understanding of the concept of recurrent education as initially presented in the 1960s. It also describes how the strategies of recurrent education for improving the equity and efficiency of educating and utilizing the reserves of human ability have changed in subsequent years. Furthermore, the logic of recurrent education is considered from two general theoretical perspectives regarding the effects on society and on the individual of an educational system organized with a recurrent strategy, namely, status attainment and structural maintenance. Finally, the reasons for the introduction of recurrent education are summarized.

The Concept of Recurrent Education: Early Developments

The development of the concept of recurrent education in the late 1960s and early 1970s was influenced by serious doubts regarding the capacity of formal education to achieve many of the goals sought by policy makers, which related to equality, efficiency, and cost-effectiveness. Olof Palme, the then Minister of Education in Sweden, launched the idea of recurrent education at an OECD meeting of Ministers of Education in Versailles in the late 1960s. In his keynote address, Palme

envisaged recurrent education primarily as a means to guarantee democracy, equality, and the right of individual freedom of choice. The idea was subsequently taken up and developed by the Swedish Education Commisson of 1968, which is commonly known by its acronym "*U68*". Whereas equality of opportunity was used as an important argument by the Commission to promote recurrent education, the idea was by and large interpreted as a means for solving some acute problems confronting the Swedish system of higher education at a critical stage in its development. For example, recurrent education was aimed at diverting young people from going straight from the school to the university, by providing opportunities for returns to education later in life.

The concept was subsequently worked out in detail by the Organization for Economic Cooperation and Development (OECD) and its Centre for Educational Research and Innovation (CERI) (See OECD, 1973). The view of the parties involved in this work was that the organizing principle for all education should not be based on the traditional "front-loaded" approach to learning, according to which learning is mainly confined to a sequence of mandatory schooling and formal education at the upper secondary and tertiary stages of the system. Instead, it was proposed that education should be interpreted as a lifelong process of human development (*U68*, 1969; Rehn, 1973; OECD, 1975; Schuller and Bengtsson, 1977). The implication was that opportunities for the provision of organized and systematic education should be made available throughout the lifetime of each individual and, in particular, in alternation with leisure activities and productive work (Bengtsson, 1974).

The early concept of recurrent education was much influenced by functionalist thinking about the implications for educational systems of changing economic, social, and political relationships in a modernizing industrial society. Recurrent education was proposed as a strategy not only for promoting equality of opportunity but also as a means for solving either actual or anticipated problems obstructing progress in rapidly developing economies. Important among these were problems associated with the introduction of new technology in the workplace, the threat of an enormous "explosion of enrolment" in higher education, and imbalances between the supply of trained workers and the demand for educational services and skilled manpower. Educational planners anticipated a shortage of well-educated professionals and

skilled middle-level technicians, and a corresponding oversupply of young adults whose schooling was expected to be deficient in vocational training (Coombs, 1968). Hence, recurrent education was viewed as a means of checking the "pressure of numbers" in higher education, of guiding more students into mainly vocational study programs and, above all, of supplying the labour market with the skilled manpower required for sustaining economic growth.

It follows that recurrent education provided welcome arguments for emphasizing the liaison between education and working life. Because the strategy of recurrent education was not only aimed at promoting equality of opportunity but also at facilitating the structural adjustment of labour markets and educational systems, and, at least in the Swedish context, at achieving full employment, the strategy can be interpreted as an expression of the idea that the degree of correspondence between educational practices and the operations of the workplace should be strengthened (Carnoy and Levin, 1985). Hence, in its initial form, recurrent education was a grand concept which sought to manage imbalances between supply and demand, as well as trade-offs between quantity and quality on the one hand, and equity and efficiency on the other.

Some rather pragmatic differences notwithstanding, the central meaning of the original idea of recurrent education was rather similar to the notion of lifelong education as proposed by Unesco, among others, in a report entitled "Learning to Be" (Faure *et al.*, 1972). Whereas lifelong education referred to a set of organizational, financial, administrative, didactic, and legal procedures for systematic learning across the life span (Dave, 1976; Lowe, 1982), recurrent education was more limited in scope and more utilitarian. The concept not only emphasized the interdependence of educational, public and economic policies (Bengtsson, 1985), but also implied instances of interruption in the lifelong process of education, as would occur if educational experiences were spaced cyclically and in alternation with other activities, such as productive work and leisure. Thus, whereas the concept of lifelong education had many advantages with regard to its holistic and humanistic appeal (Rivera, 1983), recurrent education seemed to offer more scope for actual implementation. It was expected, for example, that government administrations, employers and other interested parties such as labour collectives, would be more easily persuaded to assume legal, financial and bargaining responsibility for the, in this

case, limited provision of learning opportunities for adults in the labour force.

Particularly if examined from the perspective of the limits to growth experienced in the process of welfare state building, the planned redistribution of educational resources and opportunities over the entire life span in alternation with productive work and leisure can be interpreted as representing a pragmatic answer to problems of development both internal and external to educational systems. Because many of these problems can be assumed to be transitional rather than permanent, the goals and objectives contained in a flexible strategy for educational, social and economic development, such as those peculiar to recurrent education, should be examined in the context of the social and economic history of particular societies and their priorities for national development. Hence, the structural characteristics of an educational system organized with a cyclic strategy depend on the wider economic, political and cultural contexts of education in a modern industrial society. The implication is that recurrent education policies, practices and structures should not be regarded as being fixed but rather as time and place specific.

Recurrent Education in Decline: Major Criticisms

Recurrent education was advocated at a time when much of the optimism about the possibility of "front-loaded" formal education achieving a fair and equitable society had begun to erode. In several OECD Member States, emphasis had gradually shifted to organized adult education and learning beyond the traditional period of schooling. This new orientation implied that organized and systematic procedures for the facilitation of learning in adult life needed to be established. However, whereas several countries belonging to the OECD group had expressed an interest in recurrent education in the 1970s, very few members of the group had ventured to any significant extent into the policy domains which were implicated (Blaug and Mace, 1977; Blaug, 1985).

The gap between stated adherence and the lack of policy action can be explained in several ways (see Bengtsson, 1985; Tuijnman, 1989a). The following reasons are often mentioned in scholarly writing in the field: (1) the inadequacy of conventional mechanisms for the financing

of adult education in general and student aid in particular; (2) the scepticism of some political parties towards further rises in public expenditure on education; (3) high unemployment rates among young adults; (4) limited access opportunities to programs of study offered in universities and other institutions of tertiary education; (5) insufficient legislation, particularly with respect to the rules regulating study leave and income maintenance; and (6) structural obstacles to policy coordination arising from diversification and diffusion of responsibility in the post-mandatory sector of education. Hence, it would seem that the alleged failure to implement recurrent education policy in the 1970s was caused, at least to a significant extent, by a situation in which important prerequisites for a thorough change in education were not met. As a result, the practical usefulness of recurrent education was questioned in the late 1970s and early 1980s.

This criticism of recurrent education did not challenge the rationale for redistributing opportunities and participation in educational programs across the life span of individuals, but questioned the timing of labour market entrance and the nature and frequency of alternation between education, work and leisure. Central to the original idea of recurrent education was the delay of components of upper secondary or tertiary education until a mature age was reached, so that educational careers would be motivated by actual work experiences, realistic assessments of own capabilities, and concrete occupational choices (OECD, 1975; Stoikov, 1975). The postponement of a component of early formal education was considered essential in a strategy which aimed to enhance the efficiency and flexibility of the connection between education and employment while safeguarding free choice. As a strategy of "diversion" (Murray, 1988), conceived to contain and redirect "excessive" individual demand for higher education, a policy of postponement was advantageous, not least for educational planners, budget controllers and politicians.

The benefits of postponement have been increasingly questioned since the early 1980s, particularly at the individual level (Blaug, 1985). The original strategy of recurrent education was, at least in part, thought of as a means to control "over-education" and to supply the labour market with the required skilled personnel. Political controversy over postponement policies arose in most OECD Member States because there were contradictions between the private and the social benefits of recurrent education. As a result, postponement policy was

not matched by the appropriate incentives to individuals to forego conventional patterns of formal education for those of recurrent education (Levin and Schütze, 1983).

The Concept of Recurrent Education: Recent Developments

Rather than seriously contemplating recurrent education as a means of avoiding diffusion of responsibility for the provision of opportunities for adult learning, most governments seem to have opted for a less radical approach, such as that implied by encouraging the extension of conventional programs of adult education to a wider clientèle. Hence, for ideological as well as practical reasons, the postponement aspect of recurrent education has gradually lost some of its policy relevance (Abrahamsson *et al.*, 1988). This development was reinforced by falling school level enrolments as a consequence of a declining birthrate, controversy over the skill implications of introducing new technology, renewed emphasis on human capital as a crucial factor in the production of goods and services and, in some countries, a modest transition rate to higher education among young students. Instead of delaying a part of education until a mature age, the importance of a good quality vocational education following a broad and general schooling in providing a basis for recurrent learning has been emphasized more recently (Husén, 1989; Kairamo, 1989; Tuijnman, 1989b).

While the postponement aspect of recurrent education policy was regarded by some as dysfunctional to the needs of society and the individual (Blaug and Mace, 1977), the usefulness of the alternation principle itself was not called into question to a similar extent. Policy makers have examined ways to strengthen the working life connection and the vocational relevance of early formal education using approaches other than the one associated with the strategy of postponement. In documents published by the OECD, for example, the term "alternation education" has been used to denote the systematic inclusion in the students' educational program, and also in the teachers' working commitments, of periods of work in companies and other organizations, closely coordinated with the teaching process (OECD, 1982).

The usefulness of developing alternation as a means of facilitating new relationships between the worlds of work and formal schooling is based on a number of assumptions. For example, the inclusion in the curriculum of periods of work outside the school environment is generally believed not only to have desirable effects on students' attitudes towards education and work as well as on their occupational expectations, but also on motivation towards schooling in general and achievement in particular, youth unemployment, turnover rates of young people in the labour market, and the internal efficiency of school systems (OECD, 1985). The principal aim of alternation education is to improve the relationships between early formal education and the workplace, not only by emphasizing practical subjects and vocational elements in programs of formal study in educational institutions, but also by bringing upper secondary and higher education into a new relationship with the labour market. Thus, alternation education should be regarded as constituting a partial strategy within the wider policy contexts of recurrent education.

While the implementation of the original idea of recurrent education may be considered to have failed in certain countries with respect to specific policies, such as the postponement of a certain part of formal education until some time later in an individual's life career, the thrust of the strategy of recurrent education, namely, the development of organized procedures for the facilitation of systematic learning in adult life, has had an enormous impact on the provision of education in most OECD Member States. Even though reality may appear rather bleak compared with the visions of recurrent education presented in the original plans, statistics collected in industrial societies in recent years generally bear witness to an increasing willingness on the part of industrial companies and public sector authorities to assume a part of the responsibility for the financing of the further education and training of their personnel (OECD, 1987a; OECD, 1987b; OECD, 1988). The rapid advance in the participation rates of workers in training programs conducted either outside the work organization in external labour market training schemes or internally in firm-specific labour markets has, in turn, helped to bring about a substantial growth in the recruitment of individuals to traditional programs of general adult education. In many countries of the OECD group, large numbers of women and men are now being exposed to systematic learning experiences in the years following their exit from the "front-end" educational system,

which provides initial education and training. As a consequence, recurrent education is gaining policy relevance in reforming and planning education for the future.

Terms Used in the Study

It is acknowledged that the meaning of recurrent education can, nowadays, hardly be distinguished from the concept of continuing education. Moreover, considering the purposes of this study, it is unproductive to attempt to delineate differences between these two abstract concepts and the idea of lifelong education. In this study, recurrent education is interpreted as a move to a system of post-mandatory education that brings upper secondary and higher education into a new relationship with programs of formal adult education and in-service training in both internal and external labour markets on the one hand, and with the employment market on the other (Emmerij, 1983; Bengtsson, 1985). As a consequence, the following definition is employed:

> Recurrent education is an original policy for education which combines a labour market policy, an employment policy, a social policy, and a concept of teaching. It argues not for new educational goals and objectives but for an alternative for educational opportunity, whereby present systems are gradually transformed so that they do not any longer provide education in one stretch during an individual's youth, but over the entire life span and in alternation with other activities and, particularly, with work. (OECD, 1982, p. 13)

In this study, the terms "youth education," "early formal education" and "front-end education" are used interchangeably to denote formal education received in institutions called schools and universities before entry to the labour market. As described in detail in Chapter Five, information concerning participation in adult recurrent education has been collected for the people surveyed in the longitudinal Malmö Study from 1958 to 1984 (e.g. from 30 to 56 years of age). Because no person included in this study is known to have pursued an educational career until 30 years of age, there are no discernible problems of overlap between the measures of youth education and adult education employed in the present investigation. Consistent with the definition cited above, the term "recurrent education" is used to denote experiences of *both* youth education and adult education. Moreover, the term "adult

recurrent education" is used for clarity in this monograph to refer to cumulative experiences of adult education.

Recurrent Education and Social Stratification

In view of the width of the policy areas involved in the definition of recurrent education mentioned earlier, the concept can be approached from different disciplinary and theoretical angles. For example, because recurrent education is sometimes regarded as constituting an intermediate or formative phase in the development of modern mass education (Tuijnman, 1986), the concept can be approached from a modernization perspective (see Inkeles and Smith, 1974; Flora and Alber, 1981; Grusky and Hauser, 1984; Boli, 1989). Other social theories of relevance to an understanding of the recurrent education strategy emphasize the importance of contradiction and correspondence between the educational system and the workplace (Carnoy and Levin, 1985). The relationship between the practices of education and the workplace, and their consequences for social stratification, are central to both sets of theories.

Commonly, the stratification process is defined as the phenomenon of the movement and allocation of persons or groups among positions in social space or, alternatively, as a change in the structural environment of individuals located within these positions (Pöntinen, 1983). Stratification is regarded as a time- and place-specific outcome of a systematic process that determines structural mobility and the distribution of life chances in society. A central theme, linking classic writings to current theories and empirical research, concerns the role of schooling, post-mandatory education, and voluntary adult education in influencing social stratification. The theme is important because researchers have long argued that the allocation of individuals and groups to disparate positions in society operates through, and is made legitimate by, the ascriptive practices of education (Bowles and Levin, 1968; Bowles and Gintis, 1976; Carnoy and Levin, 1985). While the role of the educational system in transmitting the effects of home background on life chances in industrialized countries is well documented and largely beyond question, less evidence is currently available to warrant generalizations about the processes influencing individual decisions to take part in programs of adult education. Moreover, empirical evidence

about the role of adult recurrent education in the process of social reproduction is scanty.

Throughout the 20th century, the processes whereby people have come to occupy positions in the social structure have been a central research problem for social science research. Inevitably, researchers have adhered to various interests and ideologies (Goldthorpe, 1984). It is not surprising then, to discover diversity in the conceptual approaches and analytical methods so far employed in research into the role of both youth education and adult education in the stratification process. It is generally agreed that, while learning experiences and educational qualifications may, under certain conditions, provide opportunities for job advancement and structural mobility, they may also help to maintain differences among individuals. Another distinction could be made between research stressing the class aspect of social mobility, and studies concerned primarily with determinants of stratification and the degree of mobility permitted in specific societies (Halsey *et al.*, 1980; Erikson, 1984; Goldthorpe, 1984). It follows that a general but oversimplified distinction can be made between status attainment and structural maintenance approaches to research into the effects of education on the individual and society. This distinction is useful only in so far as it helps in studying divergent assumptions about the antecedents of participation and the outcomes of recurrent education which are essential to these two theoretical perspectives. In particular, the difference can elucidate the major theories used in examining the effects of education and in interpreting their substantive meaningfulness and implications for policy, research and practice in education.

Recurrent Education and Status Attainment

A large body of scholarly writing is available with a focus on the variables implicated in the process whereby social positions are allocated (Blau and Duncan, 1967; Fägerlind, 1975; Featherman and Hauser, 1978; Grusky and Hauser, 1984; Haller *et al.*, 1985; Hauser and Sewell, 1986). In the status attainment tradition, which in the context of this study is interpreted as relating to human capital and modernization theories, stratification is commonly regarded as an individuated pattern of positions within the social structure that closely reflect finely-graded

hierarchies of worth and standing (Goldman and Tickamyer, 1984; Goldthorpe, 1984). These hierarchies are often measured in terms of the relative exchange value of people on an open and competitive labour market, where employers who seek to maximize profit by optimizing the value of employees' work differentially allocate rewards to workers in accordance with real or perceived differences in production output.

Status attainment theory is often seen as being built upon the view of social prestige advanced by Weber (Keeves, 1988a). This view argues that position in society depends essentially on three factors: status, power and social class. While status is connected with the social prestige given to a person by the community, power is associated with a political context. The Weberian notion of social class is close to its Marxian counterpart in that it is assumed to have a predominantly economic and material basis (Ritzer, 1983). In the status attainment approach these different dimensions of prestige are not only assumed to be highly correlated but also to measure in combination the quantitative construct "socio-economic status".

The central empirical question in structural models of status attainment is one of discerning the degree to which life career outcomes depend on factors other than observed competence, where the latter variable is usually indicated by measured cognitive ability, formal educational attainment, or both (Fägerlind, 1987). It follows that the status attainment approach to research into social stratification finds its theoretical justification in a context of meritocracy (Husén, 1974). In the combined human capital and status attainment tradition, employees acquire knowledge, skills and attitudes of potential relevance to upward social mobility not only by means of early formal education, but also through work experience and participation in programs of adult recurrent education. Typically, a status attainment model links home background factors with indicators of cognitive ability measured by group intelligence test scores and early formal educational attainment. In turn, these variables are employed in the prediction of occupational status and earned income (Fägerlind, 1987). Haller employs the following definition:

> By a status attainment model, I mean any set of concepts that purports to describe the status attainment process of a definable set of a population at a given time and place, and that uses any set of antecedent and status variables that are amenable to systematic statistical and mathematical analysis. (Haller, 1982, p. 6)

The on-the-job training (OJT) model is based on the assumption that workers are compensated both for their efforts and for their expense in the form of upgrading, job transfers, and higher future earnings. It is implicit in the model that the acquisition of skills, knowledge and work values through participation in programs of adult education is an important factor in explaining differences in earnings between workers with similar instrumental qualifications. Much of the attraction and descriptive power of status attainment research originates from the notion that path models of life career enable researchers to investigate the association between variations in educational attainment and indicators of life career outcomes, and to distinguish between effects attributable to education and effects due to other determinants of success in a particular social and economic system (Sewell *et al.*, 1978; Behrman *et al.*, 1980). However, the omission from the model of additional factors which are related to formal educational attainment casts doubt on the findings of some studies (Hanushek, 1979; Hanushek and Quigley, 1985).

Status attainment research in sociology and the theory of human capital in economics both emphasize the critical role of formal educational attainment in the stratification of social statuses. On the one hand, status attainment research is concerned with the study of educational attainment, broadly conceived, as an antecedent of occupational achievement. On the other hand, research conducted in the human capital tradition focusses on the value of formal educational attainment in predicting adult earnings. Underpinning status attainment and human capital research is the assumption that earnings reflect differences in productivity between workers with different amounts of formal education. That is, productivity-relevant differences between people are regarded as a consequence of differences in the amount of schooling received. The concept of human capital, which essentially treats education and training as representing an investment producing both monetary and nonmonetary outputs, has in recent years been increasingly applied to other areas of human capital formation. Besides money devoted to adult recurrent education and on-the-job training, other areas of investment in the quality of the population, such as health care, are seen as constituting investments in human capital, not least because they are expected to raise the lifetime earnings of workers (Woodhall, 1987).

The model of general training proposed by Becker (1964), in which a

perfectly competitive labour market is assumed, argues that broad adult education and general training are offered by employers only when the costs are borne by the trainee in the form of a wage less than the trainee's value product during the training period (Jones, 1988). However, in the case of firm-specific training, the cost burden is shared (Bowman, 1987a). The model of general training (Becker, 1964) has been criticized on various grounds. One of these criticisms derives from the apparent contradiction between the argument emphasized by Becker (1964), that companies do not finance general training and broad human resource development if the benefits accrue to the trainee, and the evidence available in a country such as Sweden where companies and public sector employers have invested substantial resources in the further education of their personnel (Tuijnman, 1989b). This inconsistency is important because it relates to another apparent contradiction, namely, the one between the expected result that adult recurrent education has a significant positive effect on wage growth, and the failure of some studies to establish such a relationship in certain countries (Ziderman, 1987; Kalleberg and Lincoln, 1988; Tuijnman *et al.*, 1988).

Despite its dominance and theoretical appeal, serious criticisms have been levelled against the status attainment tradition in sociology and the human capital theory in economics and education, particularly since the mid-1970s. Prominent among these are claims that the approach is politically conservative, atheoretical, ahistorical, functionalistic, and incapable of adequately analyzing the social mobility phenomenon, since the assumptions undergirding the methods used are essentially invalid and divorced from social reality (Blaug, 1977; Horan, 1978; Goldman and Tickamyer, 1984; Goldthorpe, 1984; Hout, 1984). The thrust of the criticism, which has received wide recognition in the social sciences, is that the status attainment tradition has grown increasingly preoccupied with methods of statistical analysis. It is generally admitted that this almost exclusive reliance on the scientific paradigm has influenced the style of theorizing employed both in the building up of the research program and in interpreting research findings. One of the results of this criticism was an effort on the part of a number of sociologists and economists to overcome the problems inherent to the status attainment approach by integrating a concern for structure with an interest in conflict as presenting an explanatory framework for understanding the role of education in social stratification and mobility (Ritzer, 1983; Carnoy and Levin, 1985; Levin, 1987).

Recurrent Education and Structural Maintenance

The perspective referred to as structural maintenance forms a basis for various theories of social reproduction. It derives its *raison d'être* from the class analytic approach to the social mobility problem. Class analysis is based on the assumption that opportunities, capacities and other determinants of the distribution of wealth and welfare are intimately linked with the social organization of economic life (Carnoy, 1984). In class-perspective theory, much emphasis is put on the historical and relational context of social structures within which individuals and groups are located (Goldthorpe, 1984). It is assumed that people's relations to the means of production influence not only the assigning of values to their personality characteristics and educational qualifications but also limit the flow of individuals in the labour market (Levin, 1987). Thus, the focus of the maintenance approach is on the historical relations to concrete production activities of a few discrete occupational groups or social classes. In opposition to the image of society implicit in models of status attainment (Hout, 1984; Knotterus, 1987), the basic tenet of the structural maintenance approach is that meritocratic competition is illusionary, and that barriers to social mobility are neither accidental nor unique but products of the process whereby the exchange value of educational qualifications, rated achievement potential and other personality assets and traits are determined by a larger and segmented set of organizing social and economic relations (see Bowles and Gintis, 1976; Goldman and Tickamyer, 1984).

In analyzing the relationship between recurrent education and indicators of life career, research workers belonging to the structural maintenance school of thought are quite likely to emphasize the nature of the correspondence between the goals, organization and practices of early schooling and those of adult education (Carnoy and Levin, 1985). The focus, then, is on the complementary roles of youth education and subsequent adult education in transmitting and reproducing culture, ideologies, and positions in the social structure. Hence instead of regarding participants in programs of adult education and training as an essentially self-selected and rather homogeneous group, reproduction theorists tend to define participants by their position in the social structure, and to interpret participation in adult education as an outcome rather than a determinant of life career. Instead of concentrating upon the real or perceived benefits of adult education and training, this

approach leads to the examination of structural barriers to recruitment of an economic and class nature, as well as to the study of the role of adult recurrent education in the maintenance of social inequality.

Attempts have been made to move beyond basic critiques of the status attainment tradition, and to overcome the allegedly antithetical distinction between the status attainment and structural maintenance approaches to research into the role of recurrent education in social stratification (Goldman and Tickamyer, 1984; Haller *et al.* 1985; Coleman, 1986; Kalleberg and Lincoln, 1988). If nothing else, the effort to combine such disparate theoretical perspectives has proved stimulating to sociologists and other research workers in the social sciences.

The compromise view holds that models can be specified in which measures are used that enhance analyses of the process of occupational attainment without negating the possibility of arriving at a class-analytic interpretation of the role of recurrent education in structural maintenance in society. Such combined models can be seen as facilitating the estimation of social bias in the allocation of individuals and groups to distinct occupational and economic positions, as well as indicating the function of meritocracy in social opportunity. In this case, the difference between status attainment and structural maintenance models can be regarded as interpretative and, to a lesser extent, methodological, since essentially similar types of variables are specified. Thus, in the compromise perspective, it is considered that the theoretical bases for the two models should not be interpreted as being necessarily epistemologically incompatible but, depending on the rationales used to guide the specification of variables in the model, as describing complementary aspects of the mobility process whereby positions in the social structure are attained as well as maintained. It follows from this argument that the inclusion of measures of adult recurrent education and life career outcomes in a model describing the related parameters of status attainment and structural maintenance is viewed as being capable of yielding abstract estimates not only of the degree of inequality in social opportunity for a given group in a particular society, but also of the influences of recurrent education on both social mobility and structural maintenance in that society.

In so far as the relationship between post-school learning and life career is concerned, the important implication is that the inclusion of measures of adult education in a combined model of status attainment and structural maintenance can not only yield an estimate of selection

bias in the differential process of recruitment to adult education programs, but also an estimate of social bias in the recruitment of individuals and groups to different occupational and economic positions in society. In addition to these indirect measures of inequality of opportunity, the combined model can also produce an estimate of the role of meritocracy in the relationships between home background, formal educational attainment, and life career outcomes.

Arguments For and Against Recurrent Education

Inevitably, the reasons advanced for the introduction of recurrent education are tightly interwoven with the general objectives of formal education (Husén, 1969; OECD, 1973). The contrast between goals emphasizing aspects of cost-effectiveness and economic efficiency, and objectives aiming at democracy, equality of opportunity and individual free choice, is sharp – if not contradictory (Levin and Schütze, 1983; Bengtsson, 1985). Psacharopoulos (1981) makes a distinction between three sets of goals for educational systems: traditional goals, new central goals and new peripheral goals. This difference is used in the grouping of arguments in favour of developing recurrent education that are often mentioned in treatises on the subject. Among key traditional goals are the generation of economic growth and the satisfaction of social demand. New central goals relate to equity and the provision of opportunities for meaningful employment. The so-called "new peripheral" goals of education are conceptualized in terms of self-reliance, participation as an end in itself, and the coordination of diversified sectors of educational provision. A large number of reasons for the introduction of recurrent education can be extracted from the body of scholarly writing existing in the field (Faure *et al.*, 1972; OECD, 1973; Stoikov, 1975; Levin and Schütze, 1983; Bengtsson, 1985; OECD, 1985; OECD, 1988). Among the important reasons can be mentioned:

Traditional goals:

- increasing productive efficiency by maximizing a desired mix of outputs for a given level of economic inputs;
- optimizing the social allocation of educational resources;
- creating and revitalizing the required high-level manpower;
- satisfaying social demand by providing opportunities for social mobility and by improving the quality of working life and leisure;

- promoting democracy by increasing social participation in the production of knowledge.

New Central Goals:

- overcoming unemployment by reducing friction between segments of the labour market and by developing employable skills;
- reducing inequality of educational opportunity;
- improving participation of disadvantaged social groups;
- balancing the supply of and social demand for tertiary education;
- redistributing economic, cultural and political resources from high to low status groups.

New Peripheral Goals

- facilitating and enhancing the development of new attitudes towards work and the role of people in production;
- improving the coordination and integration of formal and less formal education; academic and vocational education; and work- and leisure-related forms of educational provision;
- rescuing educational institutions from disturbances created by falling enrolments as a consequence of a declining birth rate;
- de-schooling the post-mandatory sector of educational provision.

As can be inferred from the general distinction previously made between status attainment and maintenance approaches to investigating and interpreting the role of adult education in the provision of social opportunity, criticisms of recurrent education come mainly in two forms, concerned with the nature and the significance of recurrent education, respectively. A further distinction can be made between social criticism, economic criticism and political criticism (see Tuijnman, 1986, pp. 25–29). At the core of these criticisms is the idea that recurrent education may have negative repercussions on the efforts to achieve economic and industrial democracy and to promote social equality. Such negative effects could occur if selection practices discriminate against the participation in educational programs of less privileged groups of adults and workers in the labour force. Another point of criticism is that a system of education organized around a recurrent strategy may legitimate conventional practices of education,

thus endorsing the role of early formal education in the allocation of individual social status and the reproduction of classes in society.

Some writers have argued that recurrent education may limit the scope of educational reform to only minor innovations in the prevailing traditional systems of education (Carnoy and Levin, 1985). Rather than facilitating the coordination or integration of diversified sectors of formal educational systems, further diversification, deepened role conflicts and intensified competition among the providers of adult education, and the legitimation of dominant technocratic society, may be among the perhaps unintended outcomes of implementing recurrent education. This may be the case, because measures taken to encourage recurrent education, for example by extending conventional adult education to a wider audience, may inhibit the formulation of a more radical approach to educational reform. It follows that the principle of redistributing education, work and leisure over the life span by means of recurrent education has major implications for the wider economic, political and social contexts of formal education in industrial societies.

Concluding Remarks

This chapter has sketched the history of the idea of recurrent education, as well as some theoretical roots of the concept. The proposal for recurrent education emerged in the context of the real and anticipated dilemmas of development experienced in most OECD Member States as they transformed into different types of welfare societies. It was argued that the difficulty of implementing sweeping educational reforms in a context of stagnating government revenues and increasing competition for funds among public policy sectors led to some disillusionment with the idea of recurrent education, particularly in the latter half of the 1970s. However, since the mid-1980s, the policy relevance of recurrent education is once again being emphasized. Partly as the result of pressure brought to bear on government administrations by employers and worker collectives, great progress in the development of mass educational systems has been made since the principle of recurrent education was first introduced in the 1960s.

Two theoretical approaches to examining the role of recurrent education in the stratification process were discussed, namely, status attainment and structural maintenance. The first perspective views recurrent

education as a means for achieving augmented equality of opportunity and upward social mobility at later stages in the life careers of individuals. The second view sees recurrent education as a strategy for preserving the nature and characteristics of relations to production activities of a few distinct occupational groups by strengthening the connection between education and the workplace. Thus, the strategy of recurrent education is interpreted in relation to pressures to increase the quality and efficiency of the production of goods and services in an increasingly international economy, as well as in relation to conflicting demands to promote equality of educational opportunity and participation. Moreover, it can be explained as a means for legitimizing the reward system prevailing in labour markets and, in more diffuse ways, to maintain the nature of relations between groups currently existing in most industrial societies.

The reasons for recurrent education were grouped into three categories. Over and above these, a distinction was made between the two central objectives of recurrent education, namely, those of improving equity and increasing efficiency. Most criticisms of recurrent education have focussed on the apparent contradictions between these two dimensions. Indeed, it is not difficult to find examples in the history of education in which efficiency has been achieved at the cost of increased inequity. Hence, in considering the value and implications of recurrent education policy, the question arises whether trade-offs between these two dimensions are inevitable, or alternatively, whether resources can be allocated so as to increase both efficiency and equity at the same time. Institutional arrangements for the provision of further education and training in Sweden generally bear witness to the difficulty of managing trade-offs between efficiency and equity, and other dilemmas of development.

In view of the nature of the data set employed in the current investigation, in which a Swedish cohort of men is followed from 10 to 56 years of age over the period from 1938 to 1984, it is inescapable that brief attention should be given to the changing characteristics of the Swedish systems of formal education and training in working life over time. Therefore, the purpose of the next chapter is to describe major aspects of educational reform in so far as these contribute to a comprehension of the changing policy context of recurrent education in Sweden in general and to an understanding of the research findings arrived at in this monograph in particular.

Chapter 3
Recurrent Education in Sweden: Trends and Issues

As was pointed out in the previous chapter, educational reforms cannot be understood without examining relationships between education and the economic, political, cultural and legal context of society. A frame of reference is needed that locates and explains the complex interplay of factors involved in the forming of public and educational policy. In order to appreciate how the Swedish system of education and training has come about, it is necessary to study historical characteristics and long term developments in Swedish society. An analysis of this type is, however, outside the focus of this monograph. Instead, the more limited purpose of this chapter is to describe briefly the major reforms which have shaped Swedish education since the 1960s, and in particular, to describe the various components of the Swedish system of adult education and training.

Development and Change in Swedish Education

The Swedish school reforms, including those of post-mandatory education, were introduced under the dual banner of equality of opportunity and the development of citizens for a modern industrialized, pluralistic and democratic society (Marklund, 1985). The main objective at the outset was to raise the general level of educational attainment of the Swedish population. Later it was argued that not only the period of mandatory schooling was to be lengthened, but also opportunities for occasional returns to formal education were to be created. The reform of compulsory schooling, which was proclaimed in 1962, aimed at delaying differentiation, establish parity of esteem between academic and vocational studies, increase access to schooling in a given catchment area, guarantee free choice of specialization, maintain equal standards of education throughout the country, and improve the general quality of educational provision (Marklund, 1985; Husen, 1988). The social democratic desire to achieve equality of opportunity in

society at large not only influenced policies for mandatory schooling but also set the scene for other domains of educational and public policy. In the early 1960s, the assumption was that extensive reforms in education would gradually become unnecessary as the system developed a capacity for continuous growth through constant self-correction (OECD, 1969). The school reform of 1962 was regarded as the first step in this "rolling reform" program.

The school reform of 1962 had many repercussions on policy for post-mandatory education, not least ideological ones. By the time the reforms of upper secondary schooling, higher education, and adult education were planned, the objective was not only to increase equality of opportunity by weakening the decisive influence of home background. The links between education, the provision of material welfare, and the distribution in society of cultural and political resources were also strongly emphasized (Johansson, 1975; Broström and Ekeroth, 1977). This shift in focus from the antecedents of educational attainment to the impact of education on the distribution of life chances in society led politicians, labour unions and scholars to envisage a radically different set of educational policies (LO, 1969; TCO, 1973; OECD, 1973; Schuller and Bengtsson, 1977). The relaxing of eligibility requirements for higher education, the renewal and expansion of adult education programs, and the endorsement by Parliament of rules regulating paid leave of absence from work for purposes of study are examples of policies intended not only to even out disparities in access to and participation in education, but also to influence the distribution of rewards from richer to poorer groups in Sweden (Johansson, 1975; Tuijnman, 1986).

In the course of the 1960s, opportunities for adults to enrol in courses of study in liberal arts faculties at the universities were gradually expanded (Teichler, 1988). The reforms of higher education, which were legislated in 1975 and 1977, reflected policy decisions with a strong accent on recurrent education. The reform of 1977, which was part of a prolonged process of decision making that began in the 1950s, addressed the organizational structure of higher education in its totality. It was necessary for higher education to react to the changes brought about by the comprehensive school reforms (TCO, 1973). The aims were to make higher education more responsive to the needs of the labour market, and to adjust the sector to increased public demand for higher education, not least among adults in the labour force. In

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accordance with the early ideas concerning recurrent education policy spelled out in the previous chapter, the thrust of the reform was, however, to further tighten the nexus between demands for vocational qualifications, on the one hand, and the education actually offered by institutions of higher education, on the other (Heidenheimer, 1978; OECD, 1981; Marklund, 1988). Another goal was to stabilize a declining enrolment of mostly young students by opening up the doors of the university to adults, for example, by means of the so-called 25–4 admission scheme. According to this program, persons without traditional upper secondary school credentials, who were at least 25 years of age, who had been employed for four years, and who also fulfilled other formal requirements, could be admitted to study programs in the university system (Kim, 1982).

Several factors influenced the decision taken by Parliament in 1975 (Proposition 1975) to implement policies that would eventually lead to the establishment of an educational system organized around a cyclical strategy. First, the labour unions had intensified their demands in the early 1970s, with respect to the implementation of measures in the labour market and in the educational system that would enhance the opportunities for access to programs of adult education by poorly educated and low skilled workers (Rubenson, 1983). Second, it had become clear that manpower planning and educational planning required integration. Third, the reforms at the lower end of the system had affected the organization and content of higher and adult education. For example, recurrent education sought to improve the connection between upper secondary schooling and the adult education and university system by offering access to further education for youth from various programs of study at the upper secondary level, by implementing compensatory measures for the disadvantaged, and by delaying career choice. Fourth, it was considered that academic courses of study at the upper secondary and tertiary levels of the system were in too great a demand and admitted too many students compared with the intake to vocational programs. Furthermore, it was claimed by some that university curricula were not fully relevant to both the needs of the economy and those of students (Kim, 1982). Thus, emphasis was placed on the introduction of practical and vocational alternatives to traditional studies in the university system.

Recurrent education was initially proposed not only as the practical means for preventing the higher education system from expanding too

rapidly and from becoming socially regressive. It also served to provide welcome arguments for emphasizing the importance of the link between education and working life. The diversion or postponement aspect of recurrent education was considered essential in a strategy that would enhance the flexibility of the education-employment link (Murray, 1988). While claims to justify the postponement of a part of formal education in a system of recurrent education were, at least in part, concerned with ideals of democracy and equality, for policy makers and administrators, recurrent education was greatly motivated by concerns related to demands for external efficiency and internal effectiveness.

Goals for Adult Education in Sweden

In Sweden, the goals for formal adult education are specified in terms of personal enrichment and objectives associated with the economic, political, and cultural development of society. According to the Swedish Parliament, adult education in a system of recurrent education should seek to reduce the gaps in educational attainments between generations and social groups, to further democracy, to augment the cultural awareness and participation of citizens, to contribute to continued economic growth, to supply the economy with the necessary highly skilled labour, to contribute to realizing full employment, and to help achieve a more flexible distribution of work, education and leisure across the life span (Swedish Ministry of Education, 1985; Tuijnman, 1989b). The stated objectives of Swedish adult recurrent education emphasize four aspects (Swedish Ministry of Education, 1988):

- bridging the gaps in education between youth and adults;
- increasing adults' ability to get involved in, and to influence, the democratic development of society;
- training and retraining of adults for various professional tasks, making them able to influence the direction and changes of working conditions, and thereby also contributing to full employment and progress in society; and
- fulfilling adults' individual wishes for education and giving them opportunities to supplement their youth education.

Recurrent Education Policy in the 1980s

The recurrent education strategy pursued in Sweden in the 1970s was a reflection of the powerful idea that recurrent education and active labour market policies could, together, influence the distribution of opportunities and rewards in society (Johansson, 1975; Rehn, 1980). This almost unbridled belief in the feasibility of establishing recurrent education and, indeed, in the beneficial outcomes of education was, however, soon replaced by scepticism. In 1977, when a right-of-centre coalition government had assumed office, the redistributive aims of the planned reform were relaxed to a high degree (Rubenson, 1987a). It should be noted that the discussion concerning recurrent education in Sweden in the 1970s was by and large focussed on the organization and, above all, the democratization of traditional university-type education. However important, formal adult education was of less immediate concern than the reform of higher education. The issue of the further education and training of the labour force by means of in-service training and broad human resource development programs in working life was also peripheral to this policy debate. While higher education was moving away from the concept of recurrent education as presented in the reform plan of 1975, other interested parties began to pursue the view that the idea be updated (Rubenson, 1987a). In reflecting on the future relevance of recurrent education policy in the Swedish context, Abrahamsson *et al.* (1988) write:

> Recurrent education, as the principle was stated in the higher education reform, sprang from the issue of intake restrictions and from a bid to achieve closer adjustment to the labour market, added to which it was hoped that a recurrent education system would reduce the social bias of recruitment for higher education. The current strategy now prevailing stemmed from other circumstances and forces: the crisis of government finance and the advent of the information economy. (Abrahamsson *et al.*, 1988, p. 111)

Particularly since the mid-1980s, employers and labour unions in Sweden have increasingly come to recognize the importance of the further education and training of the workforce in a recurrent education strategy. In this context, it should be noted that training policy constitutes a natural topic for discussion among employers and representatives of the labour movement. Consequently, the emphasis of Swedish recurrent education policy has, to an extent, shifted from the provision of regular higher education and formal adult education to

in-service training and broad human resource development in working life. For example, in 1984, Parliament approved an ordinance containing a set of rules regulating the allocation of state subsidies to industry and public employers who provide their workforce with opportunities to participate in in-service training programs aimed at preserving and creating employment opportunity (Tuijnman, 1989b). According to this ordinance, public funds can be used to subsidize training programs in industry, enterprises and public services which are principally aimed at, first, counteracting interruptions in the production process caused by shortcomings in the level of skill and competences of the workforce, second, avoiding and reducing redundancy situations and preventing the loss of employment, third, advancing the equality of the sexes and, four, contributing toward the strengthening of the personal development of workers with little schooling or those who otherwise are in a weak position on the labour market.

A noteworthy new development is that some providers of adult education in the state-supported sector, including the Labour Market Board, the municipal adult education authorities and institutions of higher education have, since 1986, been encouraged by the government to sell their programs of adult education and training to private enterprises and public sector employers. This change in orientation has numerous implications for recurrent education policy in Sweden, not least because it provides legitimacy for commissioned education and, thus, weakens the scope for government intervention in the adult education sector. A second fairly recent development is that policy makers have been encouraged to examine ways to strengthen the vocational relevance of formal education using approaches other than that of postponement. In Sweden today, there seems to be a consensus about the desirability of extending all two-year technical and vocational programs of study at the upper secondary school level to three-year programs. According to the plans, this third year should involve deliberate alternation between classroom-based instruction and actual experience of work gained through apprenticeship training in industry and other organizations run by public sector authorities.

The examples given above serve to illustrate the point that the immediate rationale for investing in intangible human resources during the 1980s was not so much related to the goal of democratizing working life but, rather, to the objective of generating economic growth by augmenting the efficiency, flexibility and quality of producing market-

able goods and services. Today, the conflict between the redistributive goals of adult education and training policy pursued by the labour unions, on the one hand, and the economic revitalization objective adhered to by industry on the other, has come to the fore in the on-going debate about the aims, scope, organization and financing of a national training policy in industry and in the public service sector. The question is one of the emphasis to be put on the growth-related goals of job-related adult education as opposed to those of popular, general and public adult education.

Educational Stratification of the Swedish Labour Force

The part in the life history of individuals that is associated with formal education has increased substantially over the years. The average amount of schooling received by persons born around the turn of the century was somewhat less than seven years. It increased to eight years for individuals born in the 1920s. It should be noted that the cohort surveyed in the Malmö Study forms a part of this group. Formal educational attainment approached ten years for those born in the 1940s. People born in the 1960s have on average received the equivalent of 12 years of education (Jonsson, 1987; Sundin and Tuijnman, 1988). However, as a result of the expansion of adult education, problems of definition and interpretation exist. For example, an estimate of the number of years of schooling initially received is probably not a very reliable indicator of "true" educational attainment. If not used regularly or periodically updated, knowledge is likely to be forgotten or to become obsolete in the course of time. Second, many people do not stop learning upon leaving the formal system of education. Third, an age cohort's average level of educational attainment is to some extent specific for that cohort's place in social and economic history. Hence, because adult education is aimed not only at raising the level of educational attainment in the population but also at equalizing opportunities and outcomes between age cohorts, it is important that the contribution of adult education to the growth of education on average present in society be examined.

Using data principally gathered by Statistics Sweden (SCB, 1985), Sundin and Tuijnman (1988) have attempted to estimate the annual

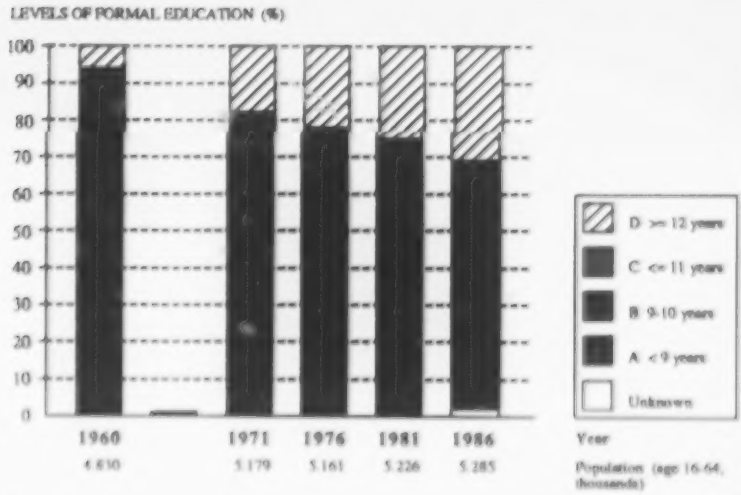

Figure 3.1. Distribution of the Swedish labour force (16–64 years) by levels of formal educational attainment (per cent, selected years).

Source: Tuijnman and Sundin (1989, p. 174).

contribution in the 1980s of formal and less-formal adult education to the mean level of educational attainment of the population comprising the labour force. Formal adult education was defined as including municipal adult education, university education, correspondence studies, and some of the courses offered by the folk high schools. Among examples of less-formal adult education are study circles run by the voluntary adult educational associations, in-service training in internal labour markets, and the larger part of public labour market training.

The central result of this study (Sundin and Tuijnman, 1988) was that the contribution of formal adult education to the growth of the mean level of educational attainment in the labour force was 75 per cent of the advance attributable to the less-formal sector of adult education. The difference was by and large due to the extraordinary volume of education and training financed by employers. However, because the official equivalence rules used in Sweden equate a two-month training program in the workplace with a two-year vocational program at the upper secondary level of the school system, the estimates of the contribution of less formal adult education could be considered inflated. As

expected, adult education has been much less important than youth education in raising the overall level of educational attainment of the labour force.

Using aggregate cross-sectional data and crude assumptions about drop out, overlap and average length of participation, Sundin and Tuijnman (1988) estimated that, in the period from 1981 to 1986, participation in programs of adult education had each year increased the level of educational attainment of one per cent of the labour force by the equivalent of one year. Compared with the total volume of adult education provision in Sweden, this estimate may appear unimpressive. It should be borne in mind, however, that a four-category measure of educational attainment was used in the study (see Figure 3.1). Hence, in order to advance from one level of educational attainment to a higher one, a substantial amount of educational experience was needed. In addition, it should be noted that one per cent of the labour force corresponds in Sweden to approximately 45,000 people (Sundin and Tuijnman, 1988).

The data in Figure 3.1 show the distribution of educational attainment by age groups in the Swedish labour force from 1960 to 1986. Due to data problems, information about the distribution of education in 1966 could not reliably be broken down in a corresponding way. The diagram shows that the relative share of poorly-educated people in the labour force, defined as the group comprising those who had received less than the equivalent of what today is mandatory schooling, decreased from 65 per cent in 1960 to 23 per cent in 1986. In contrast, the proportion of well-educated people in the population (those who had received an academic education in upper secondary schools or in universities and colleges) increased from six to 31 per cent during the same period. It should be noted that additional data on the growth of formal education in Swedish society are given in a section that follows. The estimates generally disclose that the stratification of the population comprising the labour force by levels of formal educational attainment has changed markedly since the early 1960s. As was mentioned in Chapter One in the section concerning the limitations of the study, the development of education since the 1960s thrusts interpretative difficulties upon the current investigation, since the mean level of initial education received by the men traced in the Malmö Study is eight years of schooling.

Programs of Adult Education and Training

Educational programs collectively referred to as adult education fall into a category that normally is different from schooling, and that for most people commences after a period of employment (Ministry of Education, 1988). Adult education in Sweden is organized nationally and locally, is financed by different sponsors and through public and private support schemes, consists of a multiplicity of forms, programs and facilities, and serves a large and extremely heterogeneous audience. As a result of this diversity, there are different approaches to classifying adult education. One considers the extent to which the government assumes financial responsibility for provision. Other criteria useful for classifying adult education are the institutional characteristics of programs, audiences involved, goals adhered to, and procedures used to attain these goals. A classification differentiates between education for the present job, education for a future job, and education for a leisure activity. Another possibility is to distinguish between aspects of consumption and investment in adult education. Even though it is difficult to classify programs of adult education by subject area, a content continuum could be proposed that would range from curricula concerned with leisure, culture and democracy, to curricula conferring qualifications of relevance to the occupational or educational career. A related classification could distinguish between, first, leisure- and job-related education and, second, credential and non-credential education. This classification is employed in the operational definition and measurement of adult recurrent education in Chapter Five.

It is beyond the scope of this monograph to describe in detail the structure of the Swedish system of adult education and to assess the function, volume and content of its programs. Brief historical descriptions of the development of the system and its main programs can be found in Marklund (1982) and in statements by the Swedish Ministry of Education (1985 and 1988). In view of the aims of this study, it will suffice to mention here only some general characteristics of the system.

Job-related adult education includes some of the programs conducted by labour unions, as well as the education and training provided in working life by employers. It also includes labour market training schemes, which usually provide vocational training for people of at least 20 years of age who are, or who run a risk of becoming, unemploy-

ed (Swedish Ministry of Labour, 1988). Other types of job-related adult education, which confer credits or instrumental qualifications, include higher education programs, certain courses provided by municipal adult education authorities and folk high schools, and distance education programs. *Consumption-type adult education* is not only furnished by the voluntary study circles associations but also by folk high schools, municipal adult education authorities and the media. Consumption-type adult education conferring credits or formal qualifications includes short courses and other non-degree programs of study offered by institutions of higher education. Education of this type is also provided to students enrolled in some of the programs conducted by the municipal adult education authorities and institutions for distance education.

Recruitment to Programs of Adult Education and Training

Compared with most industrialized countries, enrolment in adult education was probably high in Sweden already during the 1960s (Tuijnman, 1986). Studies describing the extent of recruitment to adult education during this period are few. One survey found sizable imbalances in the participation rates of men and women, different age groups, and workers in different occupational positions and segments of the labour market (I.O., 1969). As a consequence of the deliberate policy to encourage adults to undertake further studies, overall enrolment both in higher education and in programs of adult education and training has increased enormously since the 1960s. For example, the number of registered students in higher education rose from 37,000 in 1960 to 162,000 in 1987 (Statistics Sweden, Statistical Yearbooks). However, it should be added that about one-third of the students enrolled in universities and colleges study only single subjects in courses of a brief duration. During 1974, six per cent of the people constituting the labour force received training during working hours, compared with 26 per cent during 1987 (SCB, 1988a; SCB, 1988c). Furthermore, during 1975, 28 per cent of the adult population between 20 and 74 years of age participated in some educational activity, including in-service training and hobby courses of a short duration. The comparable figure for 1985 was 35 per cent (SCB, 1988c). In part as the consequence of the quantitative expansion of in-service training in recent years, the aggre-

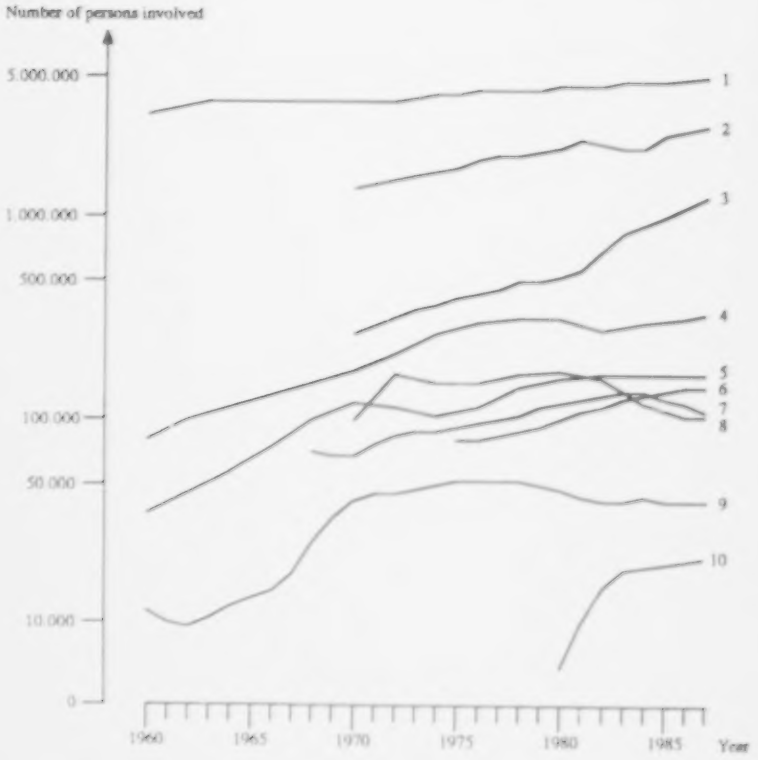

Figure 3.2. Exponential growth of the learning society. Sweden, 1960–1987 (logarithmic scale).

Source of raw data: Statistics Sweden, various origins.

Where 1. denotes women and men in the labour force;
2. denotes participants age 20–74 in all adult education programs;
3. denotes participants between age 18–20 and age 64 in in-service training programs;
4. denotes the number of study circles organized each year;
5. denotes enrolment in regular higher education;
6. denotes enrolment in three- and four-year programs of upper secondary education;
7. denotes enrolment in two-year programs of study in upper secondary education;
8. denotes enrolment in municipal adult education;
9. denotes enrolment in labour market training; and
10. denotes enrolment in programs of basic education for adults.

gate enrolment rate of the population between 18 and 64 years of age was close to 50 per cent during 1987 (Abrahamsson and Sundin, 1988).

Figure 3.2 shows the extent of quantitative growth the Swedish learning society has experienced from 1960 to 1987. It should be noted that a logarithmic scale is used, so that the trends shown are indicative of *exponential* rather than linear growth. Besides estimates of the number of men and women in the labour force, which are included as a reference standard, Figure 3.2 also shows the number of individuals in the bracket 20 to 74 years of age who each year took part in an educational activity. Moreover, estimates are included regarding the number of study circles organized each year, students in upper secondary and higher education, enrolment in municipal adult education and basic education for adults, the number of trainees reached by labour market training schemes each year, and the number of employees annually involved in personnel training and other human resource development programs conducted in working life. However, a note of caution should be made because, due to double counts, the data recorded in Figure 3.2 may, in some instances, overestimate the numbers of persons actually involved.

The central implication of the trends shown in Figure 3.2 is that, from 1960 to 1987, an increasing number of adults in Sweden have had the opportunity to acquire general adult education and job-related education during working hours. It should be observed that, by 1987, participation in employer-financed in-service training had expanded to such an extent that it surpassed the volume of enrolment in any other form of adult education in Sweden, including recruitment to study circles. It may be assumed that this increased level of participation has had implications for the provision of equality of opportunity at large in Swedish society. Methodological problems arise, however, because estimates of the participation rate of adults in programs of education over time provide insights neither into the type of educational activities involved nor their duration. Thus, even though an increased participation rate may imply a more equitable distribution of enrolment by home background or initial formal education, such statistics may also mask extensive enrolment disparities with respect to other criteria of assessment. For example, in an evaluation report written for the Swedish Ministry of Education (1985), Ahlén found that 80 per cent of all people who took part in adult education during the early 1980s enrolled in programs of only a brief duration. A particularly large social selec-

Table 3.1
Workers' participation in employer-sponsored in-service training by formal educational background, in 1986 and 1987 (representation indices, Gini coefficients)

Formal Educational Background	Year	No Training	Duration of Training Activity <1–2 Days	3–5 Days	1–4 Weeks	>4 Weeks
< 9 Years of Education	1986	1.14	0.59	0.56	0.48	0.26
	1987	1.15	0.66	0.56	0.43	0.30
9 to 10 Years of Education	1986	1.05	0.85	0.78	0.73	0.88
	1987	1.07	0.90	0.75	0.70	0.84
2 Years Upper Secondary School	1986	1.03	0.96	0.88	0.92	0.78
	1987	1.03	0.88	0.92	0.97	0.74
> 2 Years Upper Secondary School	1986	0.86	1.38	1.50	1.56	1.68
	1987	0.85	1.33	1.47	1.54	1.66
Gini Coefficients	1986	0.06	0.17	0.20	0.23	0.28
	1987	0.06	0.13	0.20	0.24	0.27

Source of data: SCB (1987, p. 11) and SCB (1988a, p. 91). Notes: (a) The representation index points out whether a given group is under- or overrepresented, and to what degree, with regard to the distribution of in-service training. A value less than 1.0 signifies underrepresentation, and a value exceeding 1.0 overrepresentation (Maas and Criel, 1982). (b) The Gini coefficient is a statistic of relative inequality across all categories at once. The coefficient approaches zero for high levels of equality and has a value of 1.0 in cases of total inequality (Johnstone, 1981).

tion bias is found in recent studies investigating the recruitment of workers to in-service training programs in the public and private sectors of the labour market (SCB, 1988a; LO, 1989).

Table 3.1 shows representation indices and Gini coefficients describing the distribution, in terms of duration, of personnel training by formal educational background. The data were gathered in connection with the Swedish labour force surveys in the spring of 1986 and 1987 (Sundin, 1987; SCB, 1987; SCB, 1988a). Usually, the term personnel training refers only to organized educational programs and on-the-job training activities that are entirely or partly sponsored by employers or their organizations. Hence, it excludes educational programs for industrial democracy organized by labour unions. The data indicate that both participation and duration varied markedly by educational background. Workers with less than nine years of education were greatly under represented among those who had received training. By contrast, those who had initially received two years or more of upper secondary schooling were over represented. The values of the representation

indices indicate that the differences tend to become greater the longer the duration of the training activity. Perhaps because the time span involved is too short, the Gini coefficients show no meaningful change in the participation rate of workers with little education between 1986 and 1987. In general, the Gini coefficients indicate a high degree of inequality in the extent to which poorly educated workers were given the opportunity to take part in training activities during working hours that lasted for three days or more.

Summary and Concluding Remarks

By describing the historical and quantitative development of the Swedish educational system over the past 25 years, particularly with regard to adult education, the current chapter has provided the general background for the study and has also outlined its policy context. The goals for adult education in Sweden were mentioned, as well as the structural characteristics of some important programs. In describing these characteristics a classification was proposed that cross-classified predominantly job- and leisure-related adult education by instrumental and noninstrumental modes of educational provision. As was pointed out in the text, this classification is used in the building of indicators of adult recurrent education in a subsequent chapter.

The difficulty of carrying through sweeping educational plans in a context of stagnating government revenues and increased competition for funds among the several sectors of public policy was noted. This situation notwithstanding, Sweden has developed an educational system with a strong emphasis on adult recurrent education. Hence, the educational system of contemporary Sweden is probably the one that, in both structure and in practice, most closely resembles the strategy of recurrent education promoted by the OECD Secretariat since the early 1970s.

As the evidence presented in this chapter indicates, the past three decades have witnessed a nearly exponential growth in the extent to which people in Sweden have taken part in programs of adult recurrent education. As a result, the costs of providing such education have probably increased enormously. Due to data problems, accurate estimates of total public and private expenditure on recurrent education in Sweden over time cannot be derived from official statistics. In the

1970/71 budget year, total public expenditure on education reached 7.6 per cent of Sweden's gross domestic product (SCB, 1988b). The corresponding estimate for 1986/87 was 7.5 per cent. Even though these figures necessarily mask substantial variations in spending, both over time and with respect to the various categories of educational expenditure within the public recurrent budget, the similarity is striking. However, the latter value especially should be considered an underestimate, since it does not take the outlay on education and training in working life by employers into account.

In a recent report, the Swedish Trade Union Confederation (LO, 1989) estimates that the cost of providing further education and training in working life by public and private sector employers totalled 20 billion Swedish Crowns in 1987. In that year, an additional nine billion was spent on formal adult education from the public recurrent budget. Hence, total expenditure on adult education and training in working life probably amounted to 30 billion Swedish Crowns in 1987. In order to get an appreciation of the enormity of the costs, this estimate should be compared with the ten billion disbursed for the financing of university education in 1986/87 and 62 billion spent on the entire system of formal education in Sweden (SCB, 1988b). Thus, crude assumptions and incomplete data notwithstanding, it appears reasonable to assert that Sweden has spent in excess of ten per cent of its gross national product on formal education, adult recurrent education and in-service training in recent years.

The breadth of participation in a system of education that, in the course of a single year (1987), recruited about half of the Swedish population between 18 and 64 years of age, as well as the enormous costs involved, make it important that systematic, empirical research concerning the outcomes and benefits of recurrent education be carried out. In order to investigate the effects of recurrent education on career outcomes, earnings and well-being, however, the theories, analytical approaches and findings of previous research in these areas of study must first be reviewed. This is the purpose of the next chapter, which presents an overview of issues and findings in four areas of research concerned with the outcomes of recurrent education for the individual.

Chapter 4

Previous Investigations: Their Findings and Implications For Theory and Model Building

The purpose of this chapter is to review the findings of previous research into the effects of predictor variables on measures of educational outcomes. Another aim is to identify their important implications for the development of hypothesized models in which the antecedent variables of recurrent education and its outcomes can be studied at the level of the individual. The review of previous studies is subdivided into four sections, namely: (1) factors influencing youth educational attainment, (2) factors influencing the decision to take part in adult education, (3) research into life career outcomes of both youth education and adult education, and (4) research on links between recurrent education, job satisfaction and general well-being. The summary is limited in that it is concerned principally with the results of inquiries carried out in West-European countries and in the United States. The implications of the findings are considered in a section concerned with theory and model building. Rather than to describe every theoretical proposition in words, diagrams of path models are shown. These indicate the hypotheses guiding the analyses of data undertaken in this investigation in graphic form. One path model is developed for each problem area delineated above. The four path models are then employed in the testing of the hypothesized relationships in subsequent chapters, by using a part of the data collected in the longitudinal Malmö Study for a cohort of Swedish men.

Factors Influencing Youth Educational Attainment

In educational research a distinction is sometimes made between two models relating input and process variables to indicators of educational outcomes: models of student learning and models of educational attainment. There are two main differences between these models. The first

concerns the emphasis they afford to the curriculum and aspects of the classroom environment in shaping educational outcomes. The second has to do with the nature of the construct typically employed as the outcome variable. For example, models of educational attainment tend to use a construct associated with an educational level, assessed either in terms of years of education completed or in terms of an educational standard reached. Models of student learning tend to focus more on the outcomes of educational experiences in the classroom. Commonly, the outcome measures employed are achievement test scores. The distinction between these two models is necessary because the processes influencing educational achievement are generally different from, but are inevitably related to, those which influence attainment. Thus, even though this study deals with the estimation of outcomes of educational attainment, research into student learning cannot be ignored, particularly since achievement outcomes must be considered to influence, at least in part, educational attainment.

Fraser *et al.* (1987) have reviewed models of student learning. They found that a limited number of variables were common and essential to most models, and that these could be traced to a few representative models, such as those developed by Carroll (1963) and Bloom (1976). Carroll's model of school learning emphasizes the time spent on the learning task (Carroll, 1989). The model has five components: (1) student aptitude, (2) student ability, (3) perseverence, (4) opportunity, and (5) quality of instruction. Modifications and extensions of this model can be found in Cooley and Lohnes (1976), Harnischfeger and Wiley (1976), Hanuschek (1979), and Sörensen and Hallinan (1986).

Three components are essential to Bloom's (1976) model of student learning: student entry characteristics, the quality of instruction, and learning outcomes. The main thesis underlying Bloom's model is that the key to successful learning lies less with time and more with the extent to which students can be motivated and instruction systematized (Bloom, 1976, p. 14). The model assumes that differences in learning can be explained and altered by modifying the cognitive and affective entry characteristics of students, and by improving the quality of instruction. A theme present in most research into Bloom's (1976) model of student learning is that family background is considered a determinant of opportunity to learn at home, including the fostering of personality characteristics and the development of attitudes and aspirations conducive to learning in school. These variables, in turn, are commonly

employed to measure the process dimension of the home or, alternatively, the "home environment" (Keeves, 1972; Majoribanks, 1974).

In the 1970s, several reviews were compiled mostly of research conducted in the United States concerned with factors influencing student learning. On the basis of these reviews, Haertel *et al.* (1983) and Fraser *et al.* (1987) identified nine generalizable factors requiring optimalization to increase learning. These factors were interpreted as constituting three components: environment, aptitude and instruction. Instructional variables, such as student time allocations and opportunity to learn, are not often included in models of educational attainment. Instead, these models focus on the interaction between the remaining components, environment and aptitude, in determining attainments and life chances.

Effects of Environment

Environment, as used in educational research, is a multifaceted concept comprising a cluster of factors. These include dimensions of the home, the classroom, the peer group, society and the mass media. However, only the first is commonly specified in models of educational attainment. Due to conceptual and analytical problems and those of valid and reliable measurement, no widely agreed upon indicators of the school or classroom environment are available for the modelling of the effects of the school on educational outcomes. However, there are a number of reasons to assume that schools make a difference. For example, studies employing measures of the sectoral and social organization of the school and the classroom, the school's practices of differentiation, streaming and ability grouping, and the authority relationships between teachers and students, have reported moderate effects on educational outcomes (Eccles *et al.*, 1984; van Laarhoven *et al.*, 1987; Lareau, 1987).

Environmental factors, such as home background, can be defined and measured in many ways. Jencks *et al.* (1979, p. 50) define home background operationally, namely, as including all potentially predictable consequences of having one set of parents rather than another. While this definition directs attention to a cluster of home background variables, it does not give an indication of the factors involved. Others distinguish between several dimensions of the home in predicting educational attainment. Some authors refer to these as the social, cultural,

and economic capital of the home (Bourdieu and Passeron, 1977; Lesourne, 1979; Coleman, 1988).

Whereas the cultural capital of the home is sometimes assessed by using variables such as library visits, travel, and theatre and museum visits, the social capital of the home is commonly indicated by variables measuring social class, parental educational attainment and occupational status. Examples of measures used in the assessment of the economic capital of the home are family income, wealth and financial assets, type of dwelling, and area of residence. In order to document the complex relationships between the home and educational attainment more adequately, investigators have sought to model the intervening influences of the attitudinal dimensions of the home. Differences between age cohorts and societies notwithstanding, the findings of studies show that the effects of social background on learning outcomes and educational attainment in industrialized countries tend to be significant, positive and reasonably stable over time (Dronkers, 1983; Keeves *et al.*, 1989). The influence of the economic resources of the home in determining youth educational attainment generally seems to be smaller than the effect of social capital. Furthermore, some studies have found that the influence of economic resources is mostly indirect, mediated by variables measuring the cultural and attitudinal dimensions of the home. The inclusion in models of educational outcomes of measures of the amount of nonwork time available to parents, their proximity to the school, attitudes to their child's schooling, support for homework, and the number of books at home, have increased the amount of variance explained in outcome measures over and above the variance accounted for by more conventional indicators of the social origins of students (e.g. DiMaggio, 1982; Iverson and Walberg, 1982; Alwin and Thornton, 1984; de Graaf, 1986; Lareau, 1987; Teachman, 1987).

Effects of Student Aptitude

A distinction is commonly made in educational research between three dimensions of student aptitude (Fraser *et al.*, 1987). These are cognitive ability, maturation and motivation. It is generally difficult to identify the appropriate moment in the lives of students at which these variables should be measured in a model that follows a conceptual sequence ordered in time. Because of this complication, indicators of

student motivation and student development assessed in terms of physical, intellectual and emotional maturity are not commonly specified in models of youth educational attainment. However, most attainment models include measures of student aptitude such as scores on standardized group intelligence tests.

Studies investigating such measures have generally found substantial positive correlations between tested cognitive ability and youth educational attainment (Fägerlind, 1975; Jencks *et al.*, 1979; Boissiere *et al.*, 1985; Bound *et al.*, 1986; Hauser and Sewell, 1986). Some authors argue that the influence of cognitive ability on educational attainment springs in part from environmental factors. The use of home background as a predictor of cognitive ability and educational attainment reduces the predictive power of tested ability. Because the correlation coefficient between home background and standardized intelligence test scores typically reaches a value of around 0.35, environmental effects seem to be implicated in the influence of cognitive ability on educational attainment (Bloom, 1964; Williams, 1976; Tuijnman, 1986).

Factors Influencing Participation in Adult Education

Compared with the research on student learning and youth educational attainment, relatively few studies have investigated the antecedents of participation in adult education. However, the results so far indicate many factors which influence the decision to take part in adult education. Commonly, studies involving antecedents of participation have adopted either a sociological, psychological or an economic framework of reference. Sociological research in this area has mainly been concerned with the links between system-level variables, characteristics of institutions of adult education, structural barriers to recruitment, and the social and educational background of the clientele. Psychological studies have dealt with theories of motivation at the individual or micro-level of analysis. The focus of studies conducted in this area has been on psychological profiles of participants, the psychological impediments to recruitment, and the motives for study. The research from an economic perspective has mainly been concerned with the assess-

ment of economic barriers to participation, and with the estimation of the costs and benefits of adult education and training (Tuijnman and Fägerlind, 1989).

Some variables influencing youth educational attainment also correlate with indicators of participation in adult education. Modest correlations have been found between participation, home background (Husén, 1969) and aspects of the home environment, such as the interest taken by parents in their child's schooling (Emanuelsson *et al.*, 1973; Tuijnman, 1986). Many studies have found subtantial correlations between measures of youth education and adult education (Johnstone and Rivera, 1965; Rubenson, 1975; Lehtonen and Tuomisto, 1975; Boshier and Collins, 1983). Other meaningful antecedents of participation are occupational status, income and work experience (Mincer, 1974; Marcus, 1986; Rosengren and Albert, 1986; Ziderman, 1987). Moreover, studies have found significant correlations between participation in adult education and demographic variables, such as age, sex, place of residence, and marital status (Cross, 1981; Boshier and Collins, 1983).

Studies investigating the relationships between the worlds of work and those of adult education and on-the-job training reveal a cluster of factors that could be involved. Prominent among these are work roles, labour market segment of employment, the size of the firm, main areas of production, the use of technology in the production process, the degree of market competition in the industrial or mercantile pursuits involved, and the extent to which workers are organized (Bergsten, 1977; Felmlee, 1982; Levin and Schütze, 1983; Deere, 1987; Sundin, 1987; Kalleberg and Leicht, 1986). A central theme of research into adult education is concerned with motivation or reasons for participation and their relationships to predictor and outcome variables. The results obtained so far suggest that motives for study vary as a function of antecedent factors, most notably age, sex, and the point in time in an individual's life career. Boshier and Collins (1983) have fitted a six-factor model of reasons for further study to data derived from 12,000 adult learners. Their findings show that two factors can be clearly identified, namely, career advancement and the pursuit of cognitive interests. In an investigation using variables derived from the Malmö Study, Emanuelsson *et al.* (1973) found that the two dominant reasons why people took part were the desire to find another job or to change to a new occupation and the wish to qualify for further formal education.

The findings of research into the network of links between indicators

of job satisfaction, work and leisure roles, interest in adult education, and subsequent participation, are generally inconclusive. For example, job satisfaction has been found to relate differently to interests in adult education, depending on the type of activity involved (Bergsten, 1977). Whereas Tuijnman and Fagerlind (1989) found a modest correlation between expressed interest and subsequent participation, early experiences of adult education correlated strongly with subsequent participation.

Whereas many variables are known to correlate with measures of participation in adult education, less is known about the causal structure of the linkages between the factors involved. While much research and theorizing has focussed on psychological issues, much less has been done explicitly on sociological issues pertaining to the antecedents and outcomes of adult education. A useful social psychological model of participation in recurrent education is presented by Rubenson (1987b, p. 43). Key variables in this "expectancy-valence" model of participation are, first, the individual's belief that he or she is in a position to complete and successfully cope with a program of adult education, and the expectation that participation will have desirable outcomes; and second, a person's perception of participation in adult education as a conceivable means of satisfying perceived needs.

Few studies have used structural equation models to predict the likelihood of participation in adult education. There are, by and large, two important reasons why statistical model building has not been extensively used as a research tool in the area of adult education. First, the preoccupation of the field with psychological characteristics of participants led to the dominance of the factor analytic approach. Second, whereas model building would logically have constituted the next phase in the development of the field, the heavy dependence of inferential statistical models on well-defined samples free from selection bias has inhibited their usefulness.

Employing variables derived from the Malmo Study, Tuijnman (1986) attempted to estimate path models predicting participation in adult education. The results were generally unsatisfactory, however, in that only small proportions of the variance in dichotomous measures of adult education could be accounted for (from 4 to 6 per cent). Using a more complex structural equation model which involved not only structural antecedents but also more traditionally psychological measures of cognitive interests and job satisfaction, Tuijnman and Fagerlind (1989)

explained 26 per cent of the variance in a category-type indicator measuring the kind and amount of adult recurrent education received by the 834 men involved in the Malmo Study over a 25-year period. Of the dozen antecedents specified in the model, five were found to exert meaningful effects on participation, namely, youth educational attainment, cognitive ability in adulthood, occupational status, job satisfaction, and interest in adult education.

Research into Life Career Outcomes of Recurrent Education

In order to investigate the associations between educational attainment and life career outcomes, it is necessary to distinguish between effects attributable to education and those resulting from other determinants of success in a given social and economic system. Central to most studies about the life career outcomes of educational attainment are two hypotheses (Taubman and Wales, 1975, p. 95). First, differences in outcomes by levels of educational attainment represent the net effects of education rather than those of other characteristics that are not held constant. Second, observed differences in career outcomes represent productivity increases dependent on educational attainments. In order to test these hypotheses, studies examining the effects of education commonly include indicators of home background, environmental factors associated with the process dimension of the home and the school, and measures of student aptitude. As shown empirically in Chapters Nine and Ten, the omission of these factors from consideration may result in an upward bias in the path coefficients estimated for the effects of education.

In economics and sociology a large body of research has become available with a focus on the processes by which home background and cognitive ability are converted into positions in the social structure by means of formal educational attainment. Even though there are substantial variations in the characteristics of models investigated so far, the findings concerning the importance of youth education for career outcomes tend to be fairly similar between countries and over time (Erikson *et al.*, 1983; Grusky, 1983; Grusky and Hauser, 1984; Haller *et al.*, 1985). For example, youth education is consistently found to have substantial effects on the occupational status of both men and women in

models of the status attainment process (Blau and Duncan, 1967; Fägerlind, 1975; Featherman and Carter, 1976; Jencks *et al.*, 1979; Behrman *et al.*, 1980; Boissiere *et al.*, 1985; Felmlee, 1988).

Decreasing Effects of Youth Education

According to Blaug (1976), earned income in industrialized societies tends to increase with age up to a point somewhere after the age of forty and then level off. Some authors have suggested that this phenomenon could be a reflection of decreasing work performance. Others have pointed out that the direct effect on status attainment of formal youth education gradually subsides during the later phases of life career. It is generally assumed that the later in life the influences of youth education on occupational status and earnings are estimated, the more likely it is that these effects are mediated by positions previously held in the labour market. A related assumption is that the impact of nonschool factors, such as experiences of work and training, tend to become more important over time as the influence of initial educational attainment diminishes. Although the writing in this field abounds with theoretical studies of the effects of adult education and training on the economy, the labour market and the career prospects of workers, research using longitudinal data in the investigation of the role of adult recurrent education in the career paths of individuals is rather scarce.

In a seminal article, Mincer (1962) has shown that the economic returns to kinds of on-the-job and in-service training are nearly equal to the benefits accruing to youth education in the years subsequent to the trial establishment period in early career. An analysis of data collected in 1962 by the U.S. Bureau of the Census from men in the 20 to 64 year age bracket revealed that early formal education was the single most important determinant of occupational status, regardless of age (Blau and Duncan, 1967, p. 181). This basic finding is supported by a host of research conducted in other industrialized societies, which, despite some variations in the structures of the models studied, confirm the important role of formal education in the status attainment process. However, the findings of this body of research are questioned in some respects by other authors who claim that the failure to specify in path models of life career outcomes indicators of work experience, skill complexity and autonomy of the work task, on-the-job training and work-related adult education, has biased the regression coefficients

estimated for the effects of initial formal education (Hanushek and Quigley, 1985).

Mincer (1974) for example found that, once his data had been standardized to control for variation in age and work experience, formal schooling exerted a maximum effect on earnings about eight years after labour market entrance. As estimated by coefficients of determination, the effects of youth education on earnings were found to decrease continuously in successive "age-experience" groups after the first decade of work experience (Mincer, 1974, p. 57). He inferred that this finding was obtained mainly because of the growing importance of accumulated work experiences at this point in time of "overtaking". Hence, during the first decade of employment, there was only a minimum of "distortion" in the earnings equation from post-school experiences of education and work (Mincer, 1974, p. 133). Evidently, the existence of on-the-job training "contaminates" the rate of return to education when the latter is estimated on the basis of aggregate, observed age-earnings profiles (Psacharopoulos, 1987, p. 221). Featherman and Hauser (1978) studied the relationships between schooling and the life career outcomes of seven cohorts of men ranging in age from 20 to 24 and 61 to 65 years. Their results confirmed Mincer's basic finding in that the influences of youth education, although persistently strong, were found to gradually decrease through the later phases of the career cycle.

Even though the strength of the relationship between schooling attainments and initial job hiring is generally unquestioned, the issue of *how* formal schooling relates to occupational success and earnings is more controversial. Some authors contend that the economic returns to schooling are not necessarily indicative of rewards of job performance and productivity enhanced by formal education, but can also result from the disposition-specific *trainability* that a higher level of educational attainment is believed to develop (Thurow, 1972; Stiglitz, 1975; Riley, 1979; Rosenbaum, 1981; Breen, 1986; Kalleberg and Leicht, 1986). For example, Bills (1988) found that educational qualifications enhanced life careers mostly "by getting people through organizational gates and onto career ladders". However, once inside the organization, credentials were of less direct value in further job assignments. Instead, Bills (1988) found that the role of other measures of "performance potential", such as age, work experience and on-the-job training, increased in the time that had elapsed between the end of formal school-

ing and the assignment of a particular occupational task.

Adult Education, Occupational Status and Earnings

The 1980s have witnessed an enormous increase in the number of studies investigating the possible effects of adult education and training programs on individual level outcomes, such as measures of occupational status and earnings. Moreover, much research has attempted to elaborate how structural influences, such as the effects on the provision of training opportunities of internal labour markets in firms and organizational hierarchies, shape the distribution of earnings among individuals. Because this study is mostly concerned with the estimation of individual level outcomes of adult recurrent education, less attention is given to organizational and industrial determinants of participation in adult education and earnings inequality.

Metcalf (1985) has reviewed an extensive body of research on the economics of both enterprise-based training and vocational education in secondary schools and industrial centres, including research pertinent to some African and Latin American countries. Reviews of research into the life career outcomes of adult education and training can be found in Duncan and Hoffman (1978), Bloch (1979), Heckman and Robb (1985), LaLonde (1986), Barnow (1987), Schütze and Istance (1987), and Kalleberg and Lincoln (1988). Nearly all reviewers have encountered difficulties in the attempt to generalize across studies, mainly because the data used have been derived from heterogeneous populations and also because these investigations have employed different methods of statistical analysis. Some of the authors mentioned above have noted that the sensitivity to sample selection bias of research into the effects of programs of adult education and training is a major problem, particularly because it greatly limits the scope for formulating general statements (Ashenfelter and Card, 1985; Heckman and Sedlacek, 1985; Ashenfelter, 1987).

Because most training programs have multiple goals, the findings of studies conducted so far tend to be inconclusive and sometimes contradictory. This is in part due to data problems and technical limitations. Conceptual and methodological differences notwithstanding, the results of research evaluating the impact on earnings of training programs operating under the so-called Comprehensive Employment and Training Act (CETA) in the United States generally show positive impacts

for women, small positive to large negative effects for adult men, and negative to essentially no impacts on the earnings of young adults. Another general result is that training in classrooms or in industrial centres is found to be less effective in raising the trainees' earnings than are in-service training in internal labour markets, on-the-job apprenticeship training and public service employment (Bassi, 1983; Fraker and Maynard, 1987; see also Barnow, 1987). Some authors have questioned the usefulness of research into the benefits of manpower training programs, such as the evaluations of the CETA programs undertaken in the United States. They argue that the results so far generated are misleading, in part because most studies have used time perspectives that are too short, and also because studies have relied upon nonexperimental methods of analysis (Gay and Borus, 1980; Ashenfelter and Card, 1985; Metcalf, 1985; Lalonde, 1986; Ashenfelter, 1987; Behrman, 1987).

Kalleberg and Lincoln (1988) have investigated the individual, organizational, and industrial determinants of earnings in samples of manufacturing employees in Japan and the United States. Their study provided strong evidence that organizational and other structural variables, such as economic segmentation, company size, and internal labour markets, generated income inequality in workers' earnings. Moreover, sizeable differences were found in the process of earnings determination both in Japan and in the United States. While the effects on earnings of youth education were significant in both countries, the effect of on-the-job training was significant in Japan but not in the United States. For all three occupational categories investigated, on-the-job training produced significant and substantial increments in pay in Japan, but not even a hint of such positive effects was evident in the sample of manufacturing employees in the United States (Kalleberg and Lincoln, 1988).

Early investigations of the outcomes of labour market training programs in Sweden have found substantial individual income gains from training (Dahlberg, 1972). However, smaller positive effects have been found for most categories of workers in the 1980s (Standing, 1988). Due to declining marginal returns, the influence on trainees' wage growth is negative for some particular groups of workers in the Swedish labour force (Björklund and Moffitt, 1987). Zero to small positive returns from training programs are also estimated in other industrialized countries (Ziderman, 1987; Finegold and Soskice, 1988).

Whereas research on the economic returns to individuals from training investments is either not supportive or inconclusive, there is evidence that higher levels of initial formal education, as well as participation in adult recurrent education and in-service training, are associated with the quality of the working life environment, general employment conditions and occupational mobility (Felmlee, 1988; Kalleberg and Lincoln, 1988; Tuijnman *et al.*, 1988). Another pervasive finding is that the delivery system for recurrent education in many industrial societies caters most efficiently for well-educated and higher level workers (OECD, 1988). Employees working in less technology-intensive sectors, workers without an adequate basic training, and individuals with low qualifications and little experience of work, participate in adult education and training programs to a lesser extent than well-educated workers (Alfthan, 1985).

The studies referred to above have greatly advanced our knowledge of how schooling and subsequent adult education and training influence life careers. However, the absence in most studies of measures of cognitive ability and the quality and amount of adult recurrent education received casts doubt on the meaningfulness of the findings. Therefore, research has so far contributed but little to our understanding of the benefits of youth and adult educational attainments in a framework of recurrent or lifelong education. Cumulative measures of adult education as intervening variables in models of the status attainment process are underutilized. In a pioneering study, Felmlee (1988) estimated the effects of returns to formal schooling from the labour market on the wages and occupational status of *women*. Her study confirmed earlier research findings that women's participation in adult education yielded modest increases in income but large increases in the status associated with subsequently attained occupations. Similar findings are reported for men from Australia (Jones and Davis, 1986).

Employing data derived from the Malmö Study, and following the main stream of status attainment research, Fagerlind (1975) estimated the effects of youth education on the occupational status and earnings of a male cohort in Sweden, using a model of the resource conversion process (Coleman, 1971). It was found that the effects of early formal education varied with the stage of life career being considered. At 25 and 30 years of age, the model accounted for a small part of the variance in earnings. But after 30 years of age a steep rise in explained variance was noted, reaching 30 per cent at age 35 and more than 50 per

cent at age 43. Using data derived from the same study, Tuijnman (1986) and Tuijnman *et al.* (1988) estimated the influences on life career outcomes of both youth education and adult recurrent education. The hypothesis guiding these two studies was that potentially productive knowledge and skills acquired through adult education mediated and reinforced the diminishing effects of early formal education on life career outcomes. The findings were that the direct effect of youth education on occupational status decreased from 30 to 52 years of age, while the effects of adult education increased modestly from age 30 to 42 and substantially from age 43 to 52. However, the direct effect of youth education was still substantial at age 52. Consistent with previous research, the inclusion of measures of adult education in the model did not greatly change the extent to which variation in earnings could be explained.

Links between Recurrent Education, Job Satisfaction and Well-being

The use of conventional economic criteria in assessing the outcomes of adult education has been criticized because it tends to negate the importance of other goals for adult education. For example, general adult education seeks to improve the welfare of people and their quality of life. Assessed by both objective and subjective measures, workplace training is not only aimed at increasing productivity and efficiency, but also at improving the quality of the working life environment and, in indirect ways, job satisfaction. The purpose of the section that follows is to review previous studies which have investigated the links between youth education, adult recurrent education, job satisfaction, and perceived well-being.

Adult Education and Job Satisfaction

The study of the sources and consequences of job satisfaction constitutes a field in which research workers have been extremely productive during recent years. Excellent reviews and elaborate summaries of hundreds of studies involving job satisfaction are found in, among others, Locke (1976), Kalleberg (1977), Mobley *et al.* (1979), Landy

and Trumbo (1980), Rhodes (1983) and Michalos (1986). Even though these surveys of research differ with respect to their emphases and styles, a few general conclusions can be drawn. Some of these have major implications for an understanding of the relationship between adult education and job satisfaction.

The first conclusion drawn from the studies mentioned above is that common socio-demographic variables account for very little of the variation in job satisfaction. Regardless of the society studied, characteristics such as sex, age, social background, tested cognitive ability and early educational attainment usually explain less than five per cent of the variance in the dependent variable. Furthermore, if individual variations in occupational levels are held constant, then the relationships between these demographic characteristics and job satisfaction disappear in many studies. Another general research finding is that job satisfaction is only weakly related to income levels, fringe benefits, and promotional opportunities offered in the workplace. Locke (1976) and Michalos (1986) have concluded, on the basis of their exhaustive reviews of previous studies, that job satisfaction increases if one or more of the following factors is optimalized: (1) enrichment of the working life environment in general; (2) enrichment of job content; (3) level of industrial democracy and workers' participation in decision making; (4) workers' perception of personal development through work; (5) levels of task autonomy and task involvement; (6) perceived significance of the work task; (7) flexitime; (8) security of employment; and (9) co-worker assistance.

These general conclusions do not, however, explain the nature of the associations between general adult education, in-service training and job satisfaction. Given that a significant association exists, the points raised above can be interpreted as providing arguments for two opposite hypotheses. Depending on which theory is adhered to, adult education and training can be seen as having either negative or positive consequences for job satisfaction. Arguments for a negative interpretation of this relationship can be derived from the standpoint that workplace training is, potentially at least, a confidence trick. In this view, training can be considered an instrument of scientific management control which has the potential to serve as a means for strengthening internal labour markets and reinforcing loyalty and dependency relations in the workplace. If in-service training facilitates the introduction and application of new technologies in the workplace, then it can also

serve as a means for speeding up the production process. Moreover, a negative relationship between training and job satisfaction could also be hypothesized if there were sufficient evidence that the processes of recruitment and the reward structures associated with programs of in-service training in firms and other organizations discriminated against the participation of certain groups of workers, since such bias might weaken the solidarity among wage earners by encouraging ambition, competition, and specialization. Hence, as training programs are probably not beneficial and socially desirable under all circumstances and for all categories of workers, the direction of the relationship between job-related adult education and job satisfaction is not necessarily positive.

If, however, it is asserted that participation in education and training programs offered in the workplace confers knowledge and skills which contribute not only to enhanced personal development but also serve as an entrance ticket to jobs with greater task complexity, autonomy and higher rewards, then education and training in working life may be regarded as a facet of working life enrichment (see Rosengren and Albert, 1986). Hence, a sequence can be hypothesized in which adult education and training, by conferring knowledge and skills of relevance to the work task, influence career prospects and, in a more diffuse way, employment security. Because studies have found a positive association between perceived job security and job satisfaction, it follows that job-related adult education may influence job satisfaction through enhanced career prospects and increased job security. Consequently, it can be hypothesized that in-service training may contribute positively to the quality of the working life environment and, thus, more specifically, to an increase in the level of job satisfaction.

Mottaz and Potts (1986) used different theories to develop five causal models in order to predict global job satisfaction. Their aim was to evaluate the capacity of each model to account for variation in job satisfaction. The results indicate that the relative effects of different antecedent factors varied according to the type of model tested. With some hesitation, Mottaz and Potts (1986) concluded that these inconsistent results were due to specification errors, confounded measurements, and omitted variables. While it is often noted that prediction relationships do not necessarily imply causality, the estimation of a relationship must imply some knowledge of a plausible explanation. Where an association exists, questions are generally raised concerning

the direction of causality. In a general way, the findings of previous research tend to substantiate the hypothesis that job-related adult education influences, either positively or negatively, job satisfaction. Because the direction of the relationship is clearer if the variables involved in the analysis of data are ordered with regard to a time sequence, the data collected in the Malmo Study can be put to excellent use in examining the relationship between adult recurrent education and job satisfaction through the testing of this relationship in a causal model.

Adult Education and Perceived Well-being

Quality of life indicators are used to register the affective and cognitive reactions of men and women to economic and social processes. They usually involve self-assessments of personal well-being with respect to both life as a whole and specific life domains (Hankiss, 1983; Inglehart and Rabier, 1986). It is common to distinguish between objective and subjective indicators of the quality of life. An objective indicator would, for example, be a measure of income. In this case, its subjective counterpart would be a measure of personal satisfaction with income (Alwin, 1987). While many different indicators of perceived well-being have been developed since the 1960s, their proneness to measurement error and response bias is noted by most workers in this field (Andrews and McKennell, 1980; Diener, 1984; McLanahan and Sorensen, 1984; Abbey and Andrews, 1986; Butler *et al.*, 1987).

Early formal education has been used as an antecedent variable of perceived well-being in many studies. These studies generally assume that individuals are influenced by educational practices not just in a passive manner as recipients, but as active and cognitively motivated participants. The influence of educational experiences on preferences, expectations, feelings, and emotional states is interpreted as a multiple force which contributes not only towards the shaping of personality characteristics, but also to social psychological traits such as self-esteem and perceived personal well-being (Thoits, 1983; Caspi, 1987). In this view, education, income, health, employment, perceptions of work and leisure, age, and self-esteem are seen as factors which facilitate or limit opportunities for participation and social interaction. Poor health and an initially low level of formal education, for example, have been found to reduce psychological well-being (Thoits, 1983). As a consequence, since educational attainment is believed to influence life chances and

the shaping of perceptions of self and society, it is possible that educational experiences, including those gained through voluntary participation in adult education, also influence the way people assess their own global life situation and evaluate their personal well-being.

However, studies involving representative samples of adult populations have generally found insignificant or weak relationships between formal educational attainment and perceived well-being (Campbell *et al.*, 1976; Moum, 1983; Mutran and Reitzes, 1984; Schuessler and Fisher, 1985; Inglehart and Rabier, 1986). After reviewing studies regarding quality of life, Abbey and Andrews (1986) conclude that demographic and social background variables, such as age, sex, education, income, marital status, and stage in the family life cycle show only weak relationships, if any, to most self-assessments of life quality. Even when several of these factors are used together in a multivariate analysis, they usually explain less than 15 per cent of the variation in perceived well-being as a whole, and rarely more than that in assessments of specific life domains (Abbey and Andrews, 1986). Another general finding is that the relationship between early education and perceived well-being is negative for some groups (Campbell *et al.*, 1976; Alwin, 1987). For example, Alwin found that, after due allowance had been made for differences in income levels, people with more education were less satisfied with their global life situation (Alwin, 1987). Several theories provide explanations for this finding (for a discussion, see Rosenberg, 1981; Singer, 1981; Hewitt, 1984; Gooderham, 1987). Within the social psychological perspective, reference group theory is perhaps the most dominant approach. This theory can be viewed as arguing that negative correlations between education, life satisfaction and perceived well-being arise because the relatively better educated groups tend to have higher aspirations, expectations and demands and, as a result, employ other reference standards in assessing their subjective life situation.

No studies have been found which have directly investigated the relationship between adult recurrent education and perceived well-being. Hence, no direct guidance was available for determining the specification of a causal model. However, some studies have reported positive correlations between psychological well-being, social interaction, and positive perceptions of major events in life (McLanahan and Sorensen, 1984; Michalos, 1986). Because people usually take part in programs of adult education on a voluntary basis and, moreover, since

participation in adult education generally involves social interaction, these findings could, perhaps, be interpreted as supporting the idea that participation in adult recurrent education positively influences life satisfaction and aspects of perceived well-being.

Job Satisfaction and the Quality of Life

Research into the relationships between job satisfaction and perceived well-being is open to theoretical and methodological criticisms regarding the direction of influence (Rodgers, 1977). However, most studies in this field assume that life satisfaction is either positively or negatively influenced by job satisfaction. As reported in Michalos (1986), Rice *et al.* (1980) have reviewed 23 studies which, together, have involved more than 350 separate of analyses of the relationship between job satisfaction and well-being. For more than 90 per cent of the cases, they found that job satisfaction influenced well-being, while none of the remaining relationships was statistically significant (Rice *et al.*, 1980; as referenced in Michalos, 1986, p. 62). This evidence would seem to support the argument that job satisfaction influences perceived well-being more than the reverse relationship.

Hypotheses and Development of Path Models

As has been mentioned previously, the purpose of the review of studies concerned with the antecedent factors and the effects of recurrent education presented in this chapter is one of providing a framework of reference within which the findings of the present investigation can be examined, qualified and interpreted. A further aim is to derive testable hypotheses from previous research which can be used to guide the inclusion of variables in structural equation models. Four models are described in the section that follows. Rather than mentioning the specific hypotheses upon which these path models are based one by one, diagrams are displayed in which each hypothesis is explicitly indicated. However, for the sake of clarity, the hypotheses which are considered to be central to the overall aims of this monograph are also referred to in the text, either in the passages that follow or in the chapters in which the path models are tested by using empirical data and the method of linear structural relations analysis (Jöreskog and Sörbom, 1988).

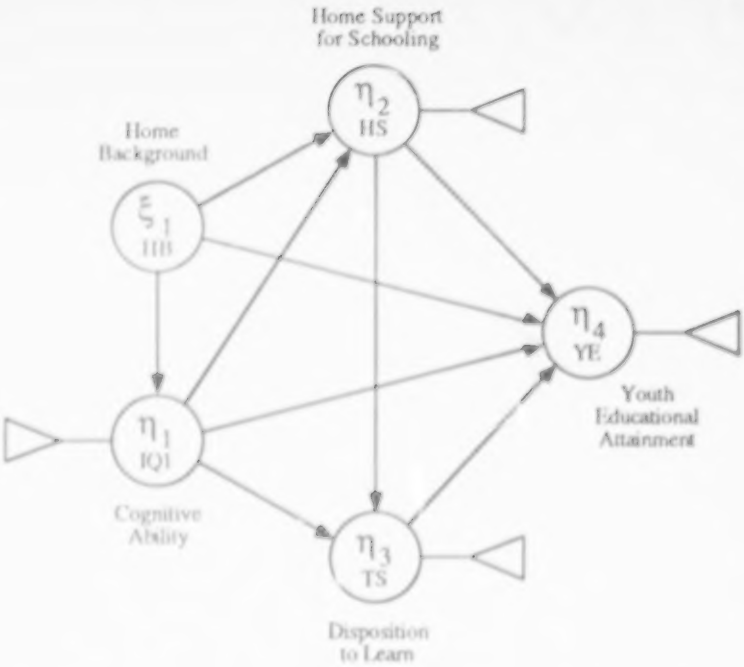

Figure 4.1. Path diagram for a hypothesized model of youth educational attainment.

Model of Youth Educational Attainment

Investigators using data derived from the Malmö Study have worked with relatively simple but very effective models of early formal or youth educational attainment (Furu, 1985; Tuijnman et al., 1988). Figure 4.1 shows a path diagram of a hypothesized model of youth educational attainment, comprising four antecedent factors. These are home background, cognitive ability, parental support for schooling, and disposition to learn in the classroom. The model is based on the following hypotheses. Home background influences tested cognitive ability. Home background and tested cognitive ability influence the attitudes parents have regarding their childrens' educational career. These parental attitudes are considered to represent an important facet of home support for schooling, which serves as an indicator of home environ-

ment. It is argued that attitudes in the home and the childrens' cognitive ability influence the way teachers evaluate their students in the classroom. Moreover, it is considered that teachers' assessments of student ability play an important role in the further educational careers of students and, eventually, influence youth educational attainment.

Model of Participation in Adult Recurrent Education

Figure 4.2 shows a diagram of a hypothetical model predicting participation in adult education and training. The model consists of two parts. The first comprises the four antecedent factors of youth education that were specified in the model shown in Figure 4.1. The second part includes four factors assumed to mediate and reinforce the effects of youth education on subsequent participation in adult education: occupational status, income, job satisfaction and expressed interest in adult education. The following hypotheses guide the specification of variables in the model. Youth educational attainment influences the decision to take part in adult education. Youth education also exerts an effect on occupational status and earnings, which, in turn, are assumed to predict job satisfaction. A third hypothesis is that the causal network of effects existing between youth education and satisfaction with the job influence the willingness of people to participate in adult recurrent education. Furthermore, it is considered that cognitive ability measured in adulthood has a direct effect on participation in adult education.

Model of Recurrent Education and Status Attainment

A central premise of the on-the-job training hypothesis is that occupational status is both a determinant and an outcome of adult education and training. Figure 4.3 presents a path diagram of a hypothesized status attainment model in which indicators of youth education and recurrent adult education are specified as predictors of life career outcomes. The problem of causation is solved by the time-bound ordering of the variables included in the model. This path model differs from the one advanced by Tuijnman (1986), as the earlier model included measurements of parental attitudes to education and expressed interest in adult education.

In accordance with the resource conversion model initially developed

Figure 4.2. Path diagram for a hypothesized model predicting participation in adult recurrent education.

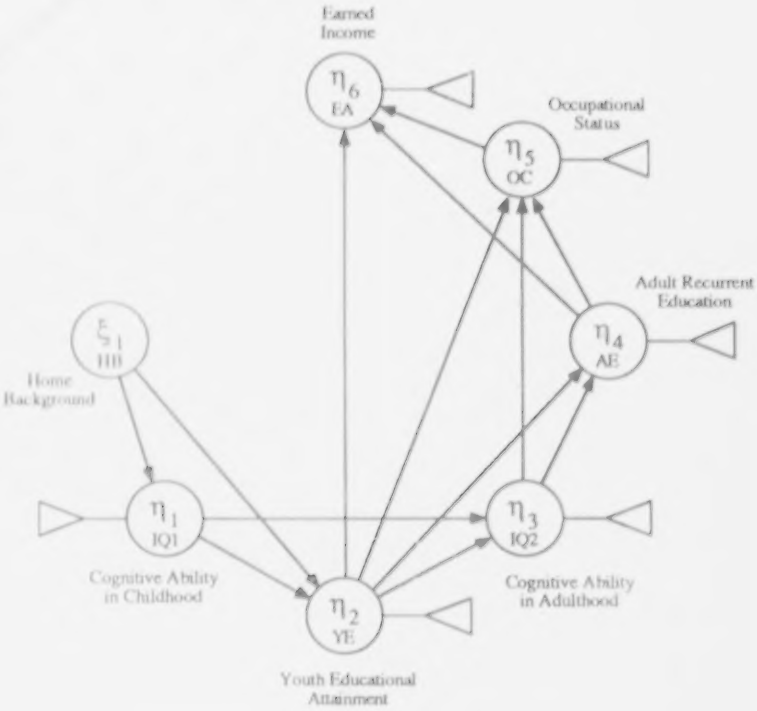

Figure 4.3. Path diagram for a hypothesized model of recurrent education and status attainment.

by Fägerlind (1975), the central hypothesis guiding the analysis of data undertaken in Chapter Nine is that the resources a person has access to during childhood, such as the social, economic and cultural assets of the home and cognitive ability, are converted into marketable resources mainly through the formal educational system. Assets obtained by means of youth education, which encompasses both schooling and regular higher education, are assumed to interact with both cognitive and environmental factors in adult life. The likelihood of participation both in general and in job-related adult education and training is regarded as an intermediate outcome of this interaction. Recurrent adult education, then, is expected to advance and update the resource conversion process (Tuijnman, 1986; Tuijnman *et al.*, 1988). Parameters

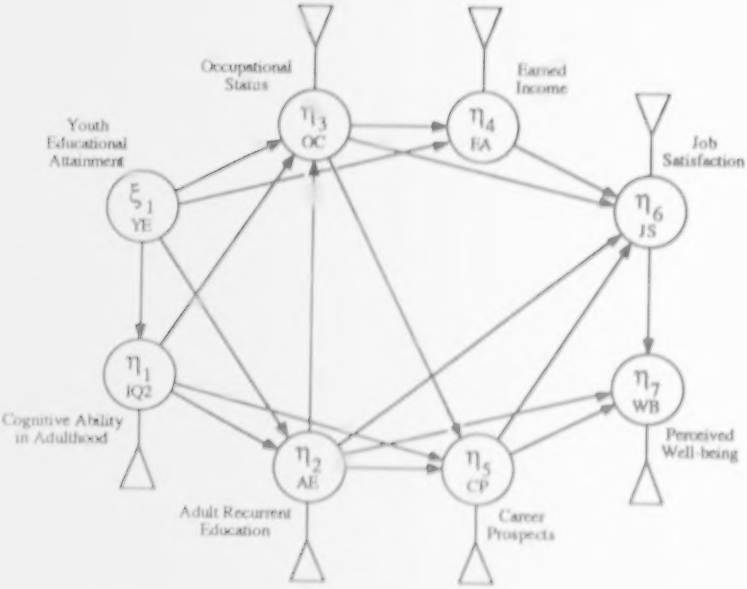

Figure 4.4. Path diagram for a hypothesized model linking youth education, adult education, job satisfaction and well-being.

of status attainment and structural maintenance in society are considered to be among the outcomes of participation in recurrent education. Because resource conversions take place at all stages of the life span, it follows that the explanatory power of given antecedent variables is expected to change as a function of the time in an individual's adult life at which career outcomes are assessed.

The hypothesized path model of status attainment presented in Figure 4.3 comprises seven components and four important blocks of relationships. First, it is argued that home background and cognitive ability measured in childhood predict youth educational attainment. Second, early cognitive ability and youth educational attainment have significant effects on cognitive ability in adulthood. Third, it is hypothesized that youth education and cognitive ability tested in adulthood influence participation in adult education and determine the amount and quality of adult educational attainment. In accordance with the classical on-the-job training hypothesis, the fourth hypothesis argues

that youth educational attainment, cognitive ability in adulthood and adult recurrent education influence occupational status and earnings. Besides a further discussion of these hypotheses, three time-related propositions are advanced in Chapter Nine to provide a background for interpreting the substantive results obtained in the analysis of data in the combined status attainment and maintenance model.

Model of Recurrent Education and Well-being

As time series data are available in the Malmö Study, the analysis of path models is seen as an appropriate strategy for answering questions involving causal relationships. Figure 4.4 displays a path diagram of a hypothesized conceptual model that includes the following variables: (1) early formal education, (2) adult recurrent education, (3) occupational status, (4) earnings, (5) career prospects, (6) job satisfaction, and (7) perceived well-being. This model is estimated in Chapter Ten in the attempt to answer the following research questions. First, how does youth education relate to both job satisfaction and well-being? Second, is there a positive relationship between participation in job-related adult education and job satisfaction? Third, does adult education influence life satisfaction? And finally, does job satisfaction contribute to or detract from perceived well-being?

The path diagram shown in Figure 4.4 indicates the network of relationships which is hypothesized. For example, it is depicted that the effects of formal youth education on job satisfaction and general well-being are not expected to be statistically significant. However, youth education exerts indirect effects as mediated by other variables in the model such as occupational status and earnings. Because previous research found no relationship between cognitive ability on the one hand and job satisfaction and well-being on the other hand, these paths are not included. Four hypotheses are of central concern. First, it is argued that the total effect of adult recurrent education on job satisfaction is positive and significant. Second, it is considered that this effect on job satisfaction is largely mediated in the model by the influences of adult recurrent education both on occupational status and prospects for career development. That is, inherent to the second hypothesis is the expectation that adult education influences occupational status and prospects for future employment. Third, it is postulated that adult recurrent education has a positive, significant effect on

perceived well-being, both directly and mediated by job satisfaction. The fourth central hypothesis follows from the one formulated above. It contends that prospects for career development and job satisfaction exert significant positive effects on self-perceived general well-being.

Summary of Issues and Implications

The primary purpose of this chapter is to provide a review of previous research into the factors influencing youth educational attainment and participation in adult recurrent education, as well as to summarize the findings of studies investigating the influences of recurrent education on life and career outcomes, including job satisfaction and perceived well-being.

Different models of student learning are reviewed in order to identify key variables so that the models employed in the analysis of data are correctly specified. Four crucial components can be identified from previous studies in the area, namely, (1) home background factors, (2) the attitudinal dimension of the home, (3) student aptitude factors, and (4) factors concerned with the process of classroom instruction. The results and conclusions of studies investigating the predictive capacity of each of these four factors in determining educational outcomes are then used to propose the first path model developed in this chapter, namely, the model specifying the variables influencing youth educational attainment. This model is tested empirically by using Malmö Study data in Chapter Seven.

Three different approaches to the investigation of the factors influencing participation in adult recurrent education are available for consideration, namely, those associated with the sociological, the psychological and the economic research traditions. The survey of previous research presented in this section is by and large restricted to sociological research. The review is used to formulate testable hypotheses which are then employed to develop a path model of the factors influencing participation in adult recurrent education. This model is estimated in Chapter Eight.

The survey of previous research into the outcomes of youth educational attainment reveals that many of the studies have included variables associated with the home environment, the school environment, and cognitive ability in models of the status attainment process.

However, most studies have failed to incorporate indicators of adult recurrent education. As a result, the direct effects of antecedent variables such as early cognitive ability or years of youth education on life career outcomes have been inappropriately specified. Because very few studies investigating the effects of adult recurrent education on life career outcomes have been found, there is clearly a need to undertake such analyses. The survey of previous studies may be used not only to identify substantial and challenging research questions, but also to propose specific hypotheses about the roles of both youth education and subsequent adult education in the status attainment process. These hypotheses are then employed to direct the specification of variables in a third model, which concerns recurrent education and status attainment. In all, seven status attainment models are estimated in Chapter Nine.

The starting point for the development of the fourth model, concerned with the relationship between recurrent education and well-being, is that adult education aims not only at improving the objective living conditions of participants but also at enhancing their subjectively perceived quality of life. Unfortunately, no models have been found from previous studies in which the relationship between adult education and well-being was explicitly investigated. Hence, the proposed model of recurrent education and well-being should be regarded as being exploratory rather than confirmatory. That is, the model is proposed as a tool for examining the issue as to whether adult recurrent education is related to job satisfaction and well-being, once individual differences in youth education and life career outcomes, such as occupational status and earned income, are held constant. The model of recurrent education and well-being is tested in Chapter Ten.

Most variables included in the path diagrams referred to above must be considered to represent theoretical constructs. Several observed measures are required for their empirical definition. The purpose of the following chapter is to describe the variables available in the Malmö Study that can serve as reliable measures of the constructs described in the current chapter. It should be noted that only some of the measures collected in the Malmö Study could be validly used as indicators of the constructs identified in the structural equation models. It is these measures which are reviewed in the account that follows.

Chapter 5
The Data Collection and Measurement of the Variables

The current chapter describes briefly the history of the Malmö Study. It also presents the scales and other details of the measurement of the observed or manifest variables which are used to form constructs of the type theorized about in the previous chapter. The LISREL method (Jöreskog and Sörbom, 1988) is employed in the empirical definition and assessment of these hypothetical constructs. Even though this analytical method can produce estimates of the reliability and overall capacity of the observed measures in indicating their hypothetical variable, it cannot ascertain the validity of the construct, since in this case theoretical reasoning is required.

The Malmö Study comprises data gathered in Sweden from 1937 to 1988 for 708 women and 834 men. For the sake of clarity, it should be mentioned that earnings data for 1984 were added to the study in 1988. Hence, the Malmö Study is unique, not least because it is one of the oldest, and still active, longitudinal investigations in the world. The prospective rather than retrospective orientation of the study is among its principal merits. Another value is that it enables research workers to investigate the role of both youth education and adult recurrent education in influencing the life career outcomes and well-being of this cohort of Swedish men and women. However, in the study reported in this volume only the *men* are considered with respect to the important outcomes of occupational attainment, earned income and perceived well-being.

The Collection of Data in the Malmö Study

The Malmö Study was initiated by Hallgren in 1937. His intention was to investigate the relationship between home background and cognitive ability (Hallgren, 1939; Husén *et al.*, 1969). In February, 1938, a group intelligence test was administered to all the 1542 students attending the 61 third-grade classes in public and private schools in Malmö. Hallgren

Table 5.1
Distribution of men surveyed in the Malmo Study, according to year of birth

Year of Birth	N	%
1925	1	0.1
1926	13	1.6
1927	88	10.6
1928	717	86.0
1929	15	1.7
Total	834	100.0

had already collected data about the students' home background during the preceding year. Table 5.1 presents the age distribution of the male students who have been followed in the Malmo Study. Largely as a result of grade repetition, there is some spread in age among the students. Because those who repeated one or more grades at the third grade level had scored significantly below average, the low ability group was slightly over represented in the population defined in 1937 and 1938. As a result, the mean score on the standardized intelligence test of the male students involved in the Malmo Study is 97.7 instead of 100.

In 1942, the first follow-up traced the school careers of the students who had transferred to the junior academic secondary school (Hallgren, 1946). In 1948, another opportunity for data collection arose because all 20-year-old Swedish men, including the youths followed up in the Malmo Study, were required to appear before a military conscription board. On that occasion, most boys were given a standardized group intelligence test (Husén and Henrieson, 1951). Husén (1950) obtained test scores for 613 of the 717 normal-aged youth in the Malmo Study and for 40 over-aged youths. Besides data on cognitive ability, Husén and his co-workers also extracted information from the military records about educational and occupational careers up to the age of 20 years. Case loss occurred mainly for three reasons. First, the boys who joined the army as volunteers were not tested on this particular occasion. Second, some youths were exempted from military service altogether. Third, the boys who had postponed their service until 1949 were examined with a different group intelligence test. In spite of the case loss, those for whom test scores were collected have been shown to be representative of the population (Husén, 1950).

Table 5.2
Response and case loss in the Malmö Study (men, numbers)

Population Characteristics	Year of Data Collection			
	1948[a]	1963	1971	1984
Master Frame Population (1938)	834	834	834	834
Deceased	7	26	38	90
Noncoverage	21	13	14	14
— Unidentified[b]	35	30	10	4
— Wrong Address	–	12	11	3
— Army Volunteers	41	–	–	–
— No Army Summons	13	–	–	–
Left in the Malmö Study	717	753	761	723
Refused to Answer	–	27	34	25
No Data (no answer at all)	64	123	150	139
Response Obtained	653	603	577	559
Age (majority of men surveyed)	20	35	43	56

Notes: (a) Cell entries under 1948 include the youth tested by the military in the period from 1947 to 1949. (b) Cell entries denoted "unidentified" comprise men for whom no identification was available at the time of data collection. (c) As a rule, army volunteers did not take the group intelligence test.

The third major follow-up began in the late 1950s when data on formal education and school marks were gathered from public registers. In 1963, a mail questionnaire was sent out to collect information about the composition of families, formal educational attainment, occupational careers, and participation in programs of adult education (Emanuelsson and Fägerlind, 1968). Another questionnaire with a similar format was sent out around 1970 (Fägerlind, 1975). A third questionnaire was administered in 1984 to collect data about occupational careers, adult education, and satisfaction with work and life in general.

Table 5.2 shows the case loss encountered in the Malmö Study. It can be seen that the location of only four men was unknown in 1984 which, given the long time span involved, is remarkable. For these men, incomplete or inaccurate information had probably been given to the school registrars in their childhood. Fourteen men resided abroad in 1984, and 90 were deceased. Thus, in 1984, 723 men or 87 per cent of the original population, which is referred to as Base 1938, remained. Of these, 559 men or 77 per cent replied to the questionnaire in 1984. However, earnings data for 1984 were obtained directly from the central tax office for 695 men or 96 per cent of the target group of 723 men.

Description of Manifest Variables

Table A5.1 in Appendix A, which is included to supplement the data given in this chapter, presents summary statistics of the measures used in the LISREL analysis. It should be noted that more than twice as many manifest variables were initially examined as were used in the investigation reported in subsequent chapters. The following strategy was used in the selection of observed measures from the Malmo Study data. First, all available manifest variables that were expected to measure a particular construct were specified in a congeneric LISREL test model. Second, this model was employed to estimate the factor loadings and indices of the goodness of fit of the test model to the data (Joreskog and Sorbom, 1988). By using these statistics and the theoretical arguments provided in Chapter Four, decisions were taken with regard to which measures should be retained for further study.

Detailed definitions of most manifest variables used in this report have been presented in earlier publications emanating from the Malmo Study (Husén, 1950; Husén *et al*., 1969; Emanuelsson *et al*., 1973; Fägerlind, 1975; Furu, 1985; Tuijnman, 1986). These variables are only briefly described below. The scales and other properties of measurement of those manifest variables which have not previously been used are described in detail. Furthermore, it should be noted that the frequency distributions of the ordinally scaled, unweighted measures are given in supplementary Table A5.2.

Home Background

Six observed measures were initially employed to assess home background. Even though much effort and time was spent in trying to use Hallgren's original data to measure *Mother's Occupational Status* and *Mother's Income*, these indicators were on the whole found to be of questionable value and, hence, were not employed in the analyses undertaken. Only 109 mothers were in the labour force in 1937. Most of them earned 1000 Swedish Crowns or less during that year. Only seven mothers had an income of 3000 Crowns or more. By contrast, 753 fathers earned on average 3750 Crowns in 1937.

The variable *Socioeconomic Status of the Home* comprises four categories based on the education and occupation of the father, family income, and family size. These categories are given rank scale scores

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A5.1

ranging from 4 to 1 from the highest to the lowest categories. Since this variable is confounded with measurements involving more than one dimension, it can be used safely only for descriptive purposes.

Father's Educational Attainment is measured on a six-category scale (see Fägerlind, 1975, p. 46) and *Father's Occupational Status* on a five-point scale. The scoring of data on the latter scale was done retrospectively, by using information originally collected by Hallgren in 1937. The categories were assigned rank scale scores as follows: (5) upper and upper middle class; (4) nonmanual employees, clerical workers in services, sales and administration, and higher-grade technicians; (3) skilled manual workers; (2) semi-skilled manual workers; (1) unskilled manual workers.

Father's Income includes income from wages, self-employment and income from capital and transfer payments in 1937 (Hallgren, 1939). Jencks *et al.* (1979, pp. 8–9) mention several advantages of using the logarithm (*ln*) of income instead of actual earnings. Hence, *ln* income is used in this monograph.

Cognitive Ability in Childhood

The measurement of cognitive ability is based on Hallgren's (1939) group intelligence test which was constructed especially for the Malmö Study. The four subtests are: (1) word opposites, (2) sentence completion, (3) perception of identical figures, and (4) disarranged sentences (Hallgren, 1939). It should be observed that there are no case losses associated with the components of these tests (see Table A5.1). The standardized variable is employed in descriptions only, whereas scores on the subtests are utilized in the assessment of cognitive ability in structural equation models.

Home Support for Schooling

Because only one observed measure is available to assess this attitudinal aspect of the home environment, its reliability cannot be estimated. *Parents' Attitude to their Child's Schooling* is measured in retrospect. The question, which was asked in 1963, had four response categories: (4) My parents wanted me to take as much schooling as possible; (3) They thought it was a good thing to go to school, but they did not care what kind of schooling I got; (2) They did not give any clear

opinion about my schooling: (1) They thought I should leave school as soon as possible to earn my living (Furu, 1985, p. 115). The measure is considered to reflect a respondent's perception of home support for schooling.

Rated Disposition to Learn

At the same time as the intelligence test was administered in 1938, teachers were asked to assess, regardless of scholastic achievement, their students' cognitive ability by providing ratings on a five-point scale. These ratings constitute the measure *Teachers' Ratings of their Students' Aptitude for Learning*. The teachers were also asked to note the students who, in their opinion, belonged to the 15 per cent most gifted and the 15 per cent least gifted among the third-graders in their classrooms (Husén, 1950). This variable is denoted with the label *Teachers' Ratings of their Students' Class Standing*. Both measures are considered to involve teacher assessments of student disposition to learn in the classroom.

Youth Educational Attainment

Two measures of youth educational attainment are available in the Malmo Study. *Years of Formal Schooling Received* is based on the number of years of schooling: (4) 15 or more years; (3) 11 to 14 years; (2) eight to 10 years; (1) less than eight years. The second measure, *Level of Formal Education Acquired*, consists of six levels of youth educational attainment (see Fägerlind, 1975, pp. 47–48): (6) some university education; (5) matriculation; (4) academic secondary education; (3) general secondary education, including some vocational training; (2) six to seven years of schooling; and (1) left school at minimum learning age, when enrolment was no longer compulsory.

Cognitive Ability in Adulthood

The group intelligence test employed by the military in 1948 consisted of four components: synonyms, concept discrimination, number series, and matrices (Husén and Henriesson, 1951). The raw scores on these subtests were transformed to a scale standardized on the Malmo Study population with a mean of 100 and a standard deviation of 15

units (Husén, 1951). This standardized variable is used for descriptive purposes, whereas the score values on the four subtests are employed to measure cognitive ability in LISREL models.

Interest in Adult Education

Interest in Adult Education, 1963, is measured on the basis of responses to the question: "Would you be interested in receiving further school education, provided that opportunities would be available locally? Those who answered in the affirmative were then asked the question: "Would you consider taking leave of absence from work to receive such further education"? It should be noted that both variables are rescaled as dichotomous measures. The questionnaire sent out in 1971 included similar items, which are coded as dichotomous measures: "Would you be interested in taking part in some form of studies or further education in the near future"? and "Would you be willing to take part in studies or further education, even if it took place during working hours"? Questions asking respondents about their interest in further education and training were, unfortunately, not included in the questionnaire distributed in 1984.

Adult Recurrent Education

Five different sets of indicators of adult recurrent education are used in this study. The first set comprises three dichotomous measures indicating whether or not a respondent took part in an adult education activity during each of the three time periods investigated. *Participation in Adult Education, 1963*, measures participation during the period from 1958 to 1963, when most respondents were 30 to 35 years of age. Similarly, *Participation in Adult Education, 1971*, covers the period from 1964 to 1971 (age 36 to 43) and *Participation in Adult Education, 1984*, involves the period from 1972 to 1984 (44 to 56 years of age).

The second set of variables measures participation in job-related adult education, while the third involves participation in traditional leisure-type programs of adult education. These indicators are measured as follows. In 1963, 1971 and 1984 the people surveyed in the Malmö Study were asked to name any adult educational activities in which they had participated during a particular period. Unfortunately, as a result of the time spent in tracing people and in handling questionnaires, some overlap has occurred between the questions seeking information about

participation in adult education during 1971. The group was also asked about the subjects or subject areas they had studied. For example;

Did you take part in some form of education or study activity after 1 January 1971? *Yes* or *No*? If *yes* what type of education:

- Personnel training. Subject and particulars ....
- Labour market training. Subject and particulars ...
- Correspondence education. Subject and particulars ...
- Shorter courses. Subject and particulars ...
- Folk high schools. Subject and particulars ...
- Basic education for adults (*Grundvux*). Subject and particulars ...
- Secondary and upper secondary education for adults (*Komvux*). Subject and particulars ...
- University courses. Subject and particulars ...
- Study circles. Subject and particulars ...
- Radio or television courses. Subject and particulars ...
- Other types of education or training: ...

Another question asked the respondents about their reasons for participating in the programs listed:

- I wanted to obtain a job or to change to a new occupation.
- I needed more knowledge in my present work.
- I was asked to participate by my employer.
- I wanted to study in order to advance my career.
- I took part in labour market training.
- I needed to prepare myself for further studies.
- I wanted to know about contemporary issues.
- I needed more knowledge for my leisure activity.
- Other reasons ...
- Comments ...

Even though the questions asked in 1963, 1971 and 1984 were not put in exactly the same words, the quality of the data gathered from the responses is identical. The approach taken was to assess this information with respect to three questions. First, if a person had taken part in a program of adult education, could the activity involved be classified as leisure- or as job-related? Second, could the activity be classified with reasonable accuracy as conferring instrumental qualifications or credits, or not? Third, if an individual had participated in more than

one program at a time, which activity could be ranked as the one granting credentials? If in doubt, the reasons provided by each individual for participation were examined.

In earlier analyses reported from the Malmö Study (Tuijnman *et al.*, 1988; Tuijnman and Fägerlind, 1989), measures of adult education were employed in which the information was assembled into five mutually exclusive categories: (1) no participation, (2) leisure-related, noncredit adult education, (3) job-related, noncredit adult education, (4) leisure-related adult education, conferring credit, and (5) job-related adult education, granting credit. Probably because this manifest variable was confounded with measurements involving more than one dimension, and also because problems of classification were encountered in cases in which persons had participated in more than one adult education activity during a given time period, it was discovered from an exploratory analysis of data using linear structural relations analysis that the scale of this variable was unsatisfactory. Since the variable was found to be unsuitable for inclusion in multiple-indicator models, it was discarded and, instead, more homogeneous measures of adult recurrent education were developed for use in the present study. These are described below.

Besides the set of dichotomous indicators of participation in adult education previously mentioned, other types of measures are also used in the analysis. The second set comprises variables which involve *only* job-related adult education and workplace training. These variables comprise rank scale scores ranging from 3 to 1 for the highest and the lowest categories, respectively: (3) participation in credential, job-related adult education; (2) participation in job-related, noncredit adult education; (1) no participation in job-related adult education. One measure is available for each of the three periods covered in the Malmö Study. These are *Job-Related Adult Education, 1963* (1958–1963), *Job-Related Adult Education, 1971* (1964–1971), and *Job-Related Adult Education, 1984* (1972–1984).

The third type of indicator measures participation in leisure-related adult education only. Rank scale scores from 3 to 1 from the highest to the lowest category are also used in this case. Three measures are available: *Leisure-Related Adult Education, 1963* (1958–1963), *Leisure-Related Adult Education, 1971* (1964–1971), and *Leisure-Related Adult Education, 1984* (1972–1984). It has been found in an exploratory LISREL analysis that these latter variables are generally similar, in

terms of their properties of measurement, to the dichotomous variables of participation overall. As a consequence, these two types of measures should not be included simultaneously in structural equation models.

Because it is interesting from both a theoretical and a substantive point of view to estimate the cumulative influences of adult recurrent education on life chances and well-being, two types of cumulative variables are employed in the analysis, each consisting of two observed measures. The first two assess participation in general adult education. These are *Cumulative General Adult Education, 1971*, which covers the period from 30 to 43 years of age, and *Cumulative General Adult Education, 1984*, which measures participation from 30 to 56 years of age.

The other two cumulative variables measure only job-related adult education, namely, *Cumulative Job-Related Adult Education, 1971* (30 to 43 years of age) and *Cumulative Job-Related Adult Education, 1984*, which measures adult education received from 30 to 56 years of age. These cumulative variables are arrived at by calculating weighted linear combinations of individual scores on the unidimensional variables described previously which involve participation in programs of leisure-related adult education or job-related adult education, respectively. The distributions of ordered score values on the resulting variables, which employ four- and five-category scales, are shown in Table A5.2, which is included in Appendix A.

Occupational Status

Data pertaining to occupational careers are available in the Malmö Study for most men from about 20 to 56 years of age (1948–1984). Until 1971, all occupations were assigned rank scale scores as follows (see Fägerlind, 1975, p. 48): (6) leading position, member of an established profession; (5) senior clerk or equivalent; (4) foreman or the like; (3) skilled manual worker; (2) semi-skilled manual worker; and (1) unskilled manual worker. Even though questionnaires were distributed at three points in time (i.e. 1963, 1971 and 1984), it was nevertheless possible to score occupations at more than three points in time, because the instruments asking the respondents to name their occupational position were designed in such a way that they obtained information about the occupational careers of each individual on a year-to-year basis. Because five-year intervals seemed useful, the scale men-

tioned above has been used in the measurement of the following variables: *Occupational Status, 1953* (age 25); *Occupational Status, 1958* (age 30); *Occupational Status, 1963* (age 35); *Occupational Status, 1968* (age 40); and *Occupational Status, 1971* (age 43).

The measurement of occupational status in a changing labour market is beset with difficulties, not least because the validity of an instrument can deteriorate over time. Some implications of time effects are discussed by Kish (1987) and Riley (1987). In order to avoid some of the problems identified by these authors, the following analytical strategy has been used in the testing for validity of the measures of occupational status employed in this monograph. The variables *Occupational Status, 1980*, and *Occupational Status, 1984*, have both been measured on different scales, using the one initially employed in the Malmö Study and some of the scales proposed by Erikson *et al.* (1983, p. 307). The resulting variables were compared and assessed with respect to the following criteria: (1) the shape of the raw score frequency distributions, (2) the standard deviations from the mean, and (3) the values of alternate-form intercorrelations among the variables, which could, with some reservation, be interpreted as crude indicators of reliability.

The scales developed by Erikson *et al.* (1983) were generally found to serve appreciably better as a means for classifying the occupations held by the men surveyed in the Malmö Study in the early 1980s. This finding was not surprising because, in these cases, an updated index could be used for the scoring of occupations which involved 13,000 occupational titles and their corresponding status codes. This index was developed by experts associated with Statistics Sweden (SCB, 1983) for the computer-based classification of occupational titles in the 1980 census of the Swedish population. By joining two previously separate categories, an occupational class variable could be developed that corresponds well with the one formerly used in analyses involving the Malmö Study data, namely: (6) higher grade professionals, administrators, managers, and large proprietors; (5) lower grade professionals, administrators and managers, as well as higher grade technicians and supervisors of nonmanual employees; (4) routine nonmanual workers in sales, commerce and administration, including rank-and-file service workers; (3) small proprietors, artisans, smallholders, farmers, and self-employed fishermen; (5) lower grade technicians, supervisors of manual workers, and skilled manual workers; and (6) semi- and unskilled manual workers.

Earned Income

Measures of self-declared personal income were obtained directly from the tax authorities for alternate years from 1953 to 1988. The variables studied in this investigation are mainly based on earned income. However, they also take income from capital transfers into account, such as pensions, sickness and study allowances, and unemployment compensation. Since the measures are build upon self-declared taxable income after tax deductions have been substracted, their accuracy is an issue of some controversy. The reliability of the income measures perused in this investigation is nevertheless assumed to be high by international standards, not only because the data were obtained from the tax office rather than from respondents. Because strict tax rules are generally applied in Sweden, there is usually not much scope for tax evasion. For example, all employing parties are required by law to report the annual earnings of their employees to the tax authorities, including indirect income and particular fringe benefits.

Seven measures are employed in the analysis, namely, *Earnings in 1953* (age 25), *Earnings in 1958* (age 30), *Earnings in 1963* (age 35), *Earnings in 1968* (age 40), *Earnings in 1971* (age 43), *Earnings in 1980* (age 52), and *Earnings in 1984* (age 56). The income variables are recoded to the nearest 1000 Swedish Crowns and are then taken to their natural logarithms. Hence, a small positive income is assigned to men with zero or negative income.

Job Satisfaction

Different measures of job satisfaction are available in the Malmö Study. The question: "How do you feel about your present job," was asked in each of the three questionnaires. The original score values on the two measures *Feelings about the Present Job, 1963*, and *Feelings about the Present Job, 1971*, have been converted to scores on a four-category scale, which conforms to the one used in the assessment in 1984 of the variable *Feelings about the Present Job, 1984* (age 56). Other measures of attitudes towards employment and the working life environment are also available in the Malmö Study. These ordinal measures, which employ Likert-type scales involving five rank-ordered categories representing an increasingly positive attitude to the statement concerned, are based on responses to the questionnaire employed in 1984.

The following measures are used in this monograph: (1) *Prospects for Future Employment, 1984*; (2) *I Would Recommend my Own Job to a Good Friend, 1984*; (3) *I Would Choose the Same Job Again, 1984*; and (4) *I Would Rather Look for a New Job, 1984*. Table A5.1 in Appendix A presents estimates of the means and standard deviations of these measures, and Table A5.2 shows their frequency distributions.

Variables measuring perceived success in life are available at three points in time for the data collected in the Malmö Study. These measures are based on responses to the question: "If you compare your situation today with expectations you perhaps had twenty years ago, do you consider that you have been ... ?". The response alternatives are: (5) very successful; (4) successful; (3) neither successful nor unsuccessful; (2) rather unsuccessful; (1) a failure. Three measures are employed in the analysis, namely, *Success in Life, 1963* (age 35); *Success in Life, 1971* (age 43); and *Success in Life, 1984* (age 56).

Perceived Well-being

The measures of perceived well-being employed in this study are based on responses to nine semantic differential scales. In the 1984 questionnaire, the men surveyed in the Malmö Study were asked to check a point on these bipolar rating scales which best described their view of life at present. The specific adjective pairs used in the questionnaire are indicated in Table A5.1. Whereas each item was originally measured on a seven-point scale, those used in this report have only five categories. The distributions of scores within these bipolar scales are shown in Table A5.2. Although the raw scores on these five-category scales are less skewed, it can be seen that, in spite of the restriction of range, entirely normal distributions are not achieved. Chapter 10 presents the variables used to measure perceived well-being in greater detail.

Reliability of Measurement

It is fairly common practice in the field of educational research to report the reliability of the variables. In cases in which the reliability of the variables is unknown, the LISREL method can be used to estimate them, provided that several measures of a given theoretical variable are

available. The approach is to include the measures in a factor analytic test model and to estimate the factor structure using the method of linear structural relations analysis, so that maximum likelihood factor loadings can be obtained. After squaring, the resulting estimates can be interpreted as the lowerbound reliability of the observed variables in measuring the theoretical variable. This approach, which has previously been used by Munck (1979) and others, is also taken in the present investigation. The factor loadings, which should be squared to obtain reliability estimates, are presented in this monograph either in the path diagrams reporting the findings of a particular analysis or in supplementary tables included in Appendix A, which generally provide the background information necessary for an understanding of the results discussed in the text.

Conclusion

Many questions asked by social and behavioural scientists involve issues concerned with the stability and variability of cause-and-effect relationships over time. Since causality necessarily involves the arrow of time, longitudinal studies present an attractive means of solving the ordering of variables in models, because earlier events can be considered to influence later events and not vice versa. In the absence of the possibility of investigating aspects of human development and change under carefully controlled experimental conditions, the need for data that involve some kind of follow up of the same people over time has been frequently noted. More than 50 years have by now elapsed since the data were first collected to lay the foundations for the social survey generally known as the Malmö Study. This unique longitudinal survey has provided the data for the measures used in the analyses undertaken in the present volume.

Naturally, the first step in this analysis is to establish beyond reasonable doubt that the manifest variables previously discussed are valid measures of the hypothetical constructs with which they are considered to be associated. However, since construct validity cannot be confirmed by means other than through theoretical reasoning, comparison with previous research and by way of empirical testing, the ultimate examination and criterion of validity must lie in the strength and meaningfulness of the results emerging from the investigation, for example, in the

form of an estimate of the overall goodness of fit of the construct to the data (Jöreskog and Sörbom, 1988). Thus, not only are a throrough review of previous research findings and a well-developed theory requirements for establishing validity, but also a clear statement as to the results expected as well as good data and sound analytical methods are needed in the validation process (Kaplan, 1988).

As is indicated in Table 5.2, the Malmö Study has encountered some case loss. This situation poses a number of both conceptual and analytical problems. For example, losses over time from the original sample can bias the analysis of the data and invalidate its results – regardless of the sophistication and accuracy of the statistical techniques actually employed. Hence, the first and foremost aim of the investigation reported in the next chapter is to find out whether those who have been lost to the Malmö Study differ from those who remain.

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Chapter 6
Compensation for Missing Data in the Longitudinal Malmö Study

In survey research, Holt (1988) writes,

> no matter how carefully the survey is designed, the actual outcome is imperfect.... Problems occur because responses are not obtained from all of the selected sample and the sample which is actually achieved is therefore deficient in comparison to what was intended.... How serious a problem this is and the effect on the survey objectives will depend on the level of nonresponse and how much respondents differ from nonrespondents in the variables of interest in the particular study. (Holt, 1988, p. 685)

If this quote applies to standard, cross-sectional surveys, it is all the more relevant to tracer studies in which the same people and variables are followed up over time with the purpose of assessing aspects of stability and change. The failure to trace people and to elicit their responses present serious problems for analysis involving longitudinal data, not least because there is a risk that respondents who are lost differ from those who remain in the study. Hence, estimates of stability and variability obtained from longitudinal studies can be seriously biased as a consequence of such losses. Research workers generally acknowledge the possibility of contamination in responses elicited over time as a result of missing data (Kalton, 1983; Plewis, 1985; Kish, 1987; Little and Rubin, 1987). Nevertheless, relatively few tracer studies have examined the extent of such contamination in their data, let alone attempted to control for the biasing effects of case loss. On the contrary, most longitudinal studies have assumed that their missing data are distributed at random. However, investigations into the nature and influence of missing values have generally found that the assumption that missing data are distributed at random and are without consequences for analysis is often not justified. Hence, the purpose of this chapter is to study these potentially harmful sources of bias in the Malmö Study data and, wherever feasible, to reduce the influences associated with such biases.

The cohort investigated in this monograph was not drawn as a probability sample in the usual sense. This is because a total population was surveyed and the probability that a student was included was equal to one at the time the first data were collected in the Malmö Study. Hence, there is no need to study the consequences of sampling error, conventionally defined. Although convenient from this point of view, the nature of the population under investigation gives rise to many other analytical problems, not least with respect to the testing for statistical significance of the parameter estimates.

In statistical theory it is generally assumed that errors associated with missing data and the accompanying bias are additive, so that such error terms may combine into a major source of variable error. This is not necessarily so with respect to errors associated with measurement and the estimation of the mean value of a variable, since in these situations the error terms may cancel. However, the variance of the error terms always contribute in an additive way to total variable error variance. The length of the time span it has covered may have rendered the Malmö Study vulnerable to case loss, time effects and errors of measurement. Numerous threats to the validity and reliability of research of data are widely discussed in treatises on research methodology and statistics. For example, Kish (1987, p. 79) presents a nonexclusive taxonomy of 22 sources of bias. This list is used as a means of conceptualizing sources of bias in the Malmö Study.

In statistics a fundamental distinction is often made between the concepts of internal and external validity (Kish, 1987, p. 83; and Keeves, 1988b, p. 121). Sometimes, a more general distinction is made between obstacles to representation and other threats to accuracy. Among the former are the possibly biasing influences of differential selection of members of groups, systematic losses due to mortality and nonresponse, discrepancies in coverage from frame to target population, and changes of the target population over time due to mobility and problems of identification. Threats to validity and reliability arise from many factors. Among these can be mentioned maturation bias, instrument bias, treatment changes over time, errors in measuring treatments, quantification bias and response style bias. Because the LISREL approach used in this study is particularly suited to accommodate the estimation of parameters in statistical models free from

measurement errors in the latent variables (Jöreskog and Sörbom, 1988), the examination and control of threats to accuracy and reliability of measurement is not the main analytical issue. It should be mentioned in this context that steps were taken at an early stage in the history of the Malmö Study to minimize distortions arising from the coding, storing and processing of data. Some evidence on the high quality of the data was obtained in 1988, when values on the variables of interest in this study were listed chronologically on separate files for all males followed up in the Malmö Study. These values were then checked for consistency, and the few observation errors found were corrected.

Indices of Selection Bias and Representation

It can be inferred from the above that it is assumed that an important threat to the validity of the present study arises from problems of representation. The divergence in coverage from the frame to the target population is seen as the principal problem, not least because a moving target design has been employed in the Malmö Study. A moving target design is commonly employed in longitudinal studies in which a population is surveyed repeatedly and over a long period of time. In addition to bias resulting from the losses of individuals from the master frame, further discrepancies have occurred due to losses from mortality, migration and nonresponse. Hence, an analytical strategy is required that can distinguish between the degree of divergence from the original or master frame population (Base 1938) and the different target populations on the one hand, and the degree of divergence in coverage from the initial master frame population to the actually observed response groups on the other. The approach taken is to distinguish between four categories of missing data and nonresponse, and to estimate their separate influences on representation in the Malmö Study: (1) noncoverage as a result of mortality; (2) noncoverage due to other reasons, such as migration and problems of identification; (3) unit nonresponse; and (4) item nonresponse.

Because both the original master frame and the moving targets are associated more with a population than with a probability sample, effect size indices are used instead of common statistical tests. The approach employed is to calculate standardized indices of the size of the difference between two comparison groups, defined as the degree of

difference between the mean scores of the two groups on a particular control variable. Indices of bias effect size are estimated using the following equation (Giaconia and Hedges, 1985, p. 5112; Hedges and Olkin, 1985, p. 78–79):

$$\delta = C\frac{\bar{X}^E - \bar{X}^C}{\hat{S}} \qquad \text{(Eqn. 6.1)}$$

where C (the correction factor for unequal case bases) is given by

$$C = 1 - \frac{3}{4n^E + 4n^C - 9} \qquad \text{(Eqn. 6.2)}$$

and n^E and n^C denote the case bases of the two comparison groups and ($\hat{S}$) refers to the pooled between-group standard deviation. A positive index value signifies that the mean score of a group of men missing on a control variable exceeds the score on that control of the comparison group, while a negative value connotes the opposite.

The following guidelines have been used in the interpretation of effect sizes (Cohen, 1969; Giaconia and Hedges, 1985): a value of 0.20 denotes a small effect; 0.50 refers to a moderate effect, and 0.80 signifies a large effect. Under conditions of partial overlap between the two population distributions being compared, an effect size with a value of 0.20 implies that the probability that the mean score of a group comprising case loss exceeds the mean score of the comparison group is approximately 0.54 (see Cohen, 1969, pp. 18–20). Whereas some studies have used the value of 0.20 as a threshold level for the significance of effect sizes (e.g. Lee and Bryk, 1986), others have employed the less rigorous threshold value of 0.30 (e.g. Hedges and Olkin, 1985).

Two types of effect size indices were used in this study. If the mean scores of a group of men associated with a particular category of nonobservation are compared with the mean score on the control variable of the population involved in the master frame, then the symbol δ is used to denote the size of the selection effect arising from that particular type of case loss in the Malmö Study. For example, if the mean score on cognitive ability in childhood of the men who were dead by 1971 is compared with the score on this control variable of the entire master frame, then δ denotes an index of the standardized difference in cognitive ability between the men associated with each of the comparison groups. This difference can then be interpreted as an index of one aspect of selection bias, namely, mortality.

The other index refers to the degree of divergence in representation

from the observed groups to the original master frame, denoted with the symbol γ. In order to differentiate clearly between the application of effect sizes as standardized indices of selection bias and their use as representation indices, a different calculation base is used in the estimation of representation indices. In this case, effect sizes are taken to base 1.00, so that an effect size of 0.12 is written as a representation index of 1.12, and -0.06 as an index of 0.94. It should be noted that representation indices with values ranging in size from 0.80 to 1.20 are considered not to be reliably different from zero.

Effects of Mortality and Noncoverage

The high life expectancy in Sweden notwithstanding, 90 of the men followed up in the Malmö Study had died prior to 1985. Furu *et al.* (1984, p. 3) found that, by 1979, 7.3 per cent of the 834 men surveyed in the Malmö Study had passed away. The estimate for the corresponding age group of men in the Swedish population was 7.7 per cent.

Table 6.1 presents effect sizes for the degree of discrepancy in mean scores on early cognitive ability of the cases associated with the master frame and those involved in the groups associated with mortality and noncoverage. The intelligence test scores obtained in childhood (IQ38) are ideally suited to serve as the control variable for two reasons. First, there is no identifiable case loss associated with this variable (see Table A5.1). Second, early cognitive ability is known from previous studies to correlate substantially with many other variables of interest in this investigation (Husén *et al.*, 1969; Fägerlind, 1975; Furu, 1985; Tuijnman, 1986). The indices presented in Table 6.1 show that the effects of mortality are small but meaningful, with values in excess of the 0.20 threshold significance level. As there were three times as many deceased men in 1984 as in 1963, and at least twice as many compared with 1971, the higher effect size of mortality in 1984 is expected.

Conventional statistical theory is based on the assumption that nonsampling errors are additive (Kish, 1965). If this is correct, then the possible effect of noncoverage on total variable error should subsume not only the biasing effects of mortality but also those arising from other types of noncoverage. It can be observed from Table 6.1 that the effects of mortality are opposite in sign to those of an aggregate of other categories of noncoverage calculated for the years 1971 and 1984.

Table 6.1
Indices of selection bias (δ) and indices of representation (γ) (means $\bar{X}$, pooled standard deviations $\hat{S}$, effect sizes)

Year	Mortality Effects			Representation (target-frame)			Noncoverage Effects (other factors)		
	$\bar{X}$	$\hat{S}$	δ	$\bar{X}$	$\hat{S}$	γ	$\bar{X}$	$\hat{S}$	δ
1963	93.7	16.1	**-0.24**	98.0	15.9	1.02	95.5	16.8	-0.13
1971	93.8	16.1	**-0.24**	97.8	16.0	1.00	103.5	16.0	**0.35**
1984	92.7	16.2	**-0.31**	98.2	15.8	1.03	104.9	16.0	**0.44**

Notes: (a) Seven men had died prior to age 21. Meaningful effect size indices for 1948 cannot be calculated since only very few cases would be involved. (b) Cognitive ability in childhood (IQ38) is employed as the control variable. (c) Selection bias indices (δ) denote the size of the standardized difference between the lost group and the original or master frame population (Base 1938). (d) Representation indices (γ) denote the degree of discrepancy between the actually surveyed group (achieved) and the master frame population (intended). (e) Indices with values in the ranges from -0.20 to 0.20 and 0.80 to 1.20 are not considered to be significant. See text.

Because this is not the case in 1963, noncoverage must have been of a different nature at that point in time in the data collection. Table 5.2 in the preceding chapter indicates that there were more unidentified and otherwise unlocated men in 1963 than in 1971 or 1984. Some of the men who were not found had been sailors without a permanent home address in 1963. The men who died early in life, and those who could not be identified or located in 1963, had scored below average on the group intelligence test administered in childhood. By contrast, the group of men who resided abroad or who could not be found for some other reason in 1971 and 1984 had scored well above average on the test. As a result, the effects of noncoverage and mortality are found to reinforce each other in 1963, and to cancel each other in 1971 and 1984.

The values of the representation indices suggest that the target populations employed for the data collection conducted in 1963, 1971 and 1984 slightly over represented, though not significantly so, an above-average group with respect to cognitive ability. Because only 26 men had died prior to 1963, and also because the selection effects of other categories of noncoverage were not significant (-0.13), the divergence in coverage from the target to the master frame is not significant even with respect to the data gathered in 1963. Hence, with regard to the distribution of cognitive ability levels in the population, noncoverage seems not to have significantly disturbed the representativeness of the moving targets employed on the occasions of data collection by means of questionnaire instruments in the Malmö Study.

Effects of Nonresponse

In statistical theory, a distinction is usually made between individual or unit nonresponse and item nonresponse (Kish, 1965). By partialling out the effects of unit noncoverage from those of total nonobservation, the effects of unit nonresponse can be estimated. Then, after controlling for the influences of unit nonresponse, the effects of item nonresponse can also be estimated, since any remaining variation in the case bases associated with the items would have had to result from item nonresponse. While this strategy is technically feasible, an alternative approach is used in this study. Indices of the biasing effects of item nonresponse are considered unproductive because very few cases would be involved in their estimation. Instead, the effects of aggregate noncoverage are singled out from those of total nonobservation at the questionnaire level, thus yielding indices of the biasing effects of unit nonresponse. No explicit attempts are made to partial out the effects of unit nonresponse from those of item nonresponse.

Table 6.2 shows indices of the effect sizes of nonobservation and unit nonresponse at the questionnaire level as well as for the earnings measures collected from the tax authorities. It can be seen that the effects of total nonobservation become smaller in size as the panel grows older. Whereas the biasing influences of nonobservation are small but significant in 1963 and 1971, they are of borderline significance in 1984. On the other hand, the effect sizes of unit nonresponse are slightly more substantial. Table 6.2 also shows that the cases involved in the measurement of the income measures obtained from central tax records are, as a group, generally more representative of the master frame than are the groups reached by the three questionnaires, as would be expected. As is indicated in Table 6.1, the differences in coverage between the target populations and the master frame are small and mostly inconsequential. Hence, it can be expected that the effect sizes of unit nonresponse are close to those of total nonobservation. The results presented in Table 6.2 show that this is indeed the case.

The effect sizes presented in Table 6.2 are associated with the influences of nonobservation and nonresponse at questionnaire level only. However, because item nonresponse has also occurred, indices at the item level have also been calculated. The results are presented in supplementary Table A6.1, which also includes representation indices

Table 6.2
Selection bias indices of total nonobservation and unit nonresponse (means $\bar{X}$, pooled standard deviations $\hat{S}$, effect sizes δ)

Year	Effects of Total Nonobservation (questionnaires)			Effects of Unit Nonresponse (questionnaires)			Effects of Total Nonobservation (income variables)		
	$\bar{X}$	$\hat{S}$	δ	$\bar{X}$	$\hat{S}$	δ	$\bar{X}$	$\hat{S}$	δ
1963	93.2	16.3	**0.27**	92.8	16.2	**–0.30**	94.3	16.3	**–0.21**
1971	94.1	16.6	**–0.22**	92.8	16.5	**–0.29**	93.9	16.3	**–0.23**
1984	94.6	16.4	–0.19	94.5	16.2	–0.20	96.4	16.2	–0.08

Notes: (a) Cognitive ability in childhood (IQ38) is employed as the control variable. (b) Selection bias indices (δ) denote the size of the standardized difference between the lost group (not observed) and the original or master frame population (Base 1938). (c) Indices with values in the range from -0.20 to 0.20 are not considered to be significant. See text.

showing the degree of discrepancy between the original master frame and the actually observed response groups. Effect sizes which exceed in magnitude the 0.20 threshold level of significance are italicized. It can be seen from the data recorded in Table A6.1 that the aggregate effects of nonobservation are more substantial at item level than at questionnaire level (see also Table 6.2). Even though many indices exceed the critical value of 0.20, none are larger in magnitude than the less stringent significance level of 0.30. Thus, it can be concluded that the disturbances introduced in the items are small and, hence, can be assumed to be generally without major consequences for the analyses of data presented in subsequent chapters. This interpretation is supported by the values of the representation indices presented in Table A6.1. These indices show that the case bases associated with the income measures and with the variables observed in 1938 and 1948 are representative of those in the master frame. On the other hand, the cases involved in the measurement of the items derived from the questionnaires are not entirely representative. However, because the values of the representation indices do not exceed the critical level used in this report, the effect sizes of total nonobservation can be considered to be insignificant at the item level, at least in so far as the scores on the intelligence test are concerned.

Statistical Analysis with Missing Data

In order to obtain accurate estimates of standard errors and goodness of fit using conventional statistical tests, full data coverage on all items included in a given analysis is commonly required. While this condition can be met through the listwise deletion of missing data, this procedure can also give rise to other problems of analysis, not least those associated with high attrition rates. For these reasons, listwise deletion of missing data is not common in longitudinal studies. However, if pairwise deletion is employed then the use of common statistical tests is highly problematic because of the variation in the number of cases for each statistic calculated. In this situation, accurate estimates of test statistics can still be obtained with the use of complex sample replication procedures, such as the bootstrap method or the jackknife technique (Wilson, 1988). As has been noted before, the master frame of the Malmö Study is associated more with a population than with a simple probability sample. As a consequence, sample replication procedures can be considered of doubtful utility in the case of the current investigation. A different analytical strategy is therefore needed.

Even though the development of statistical procedures for the multivariate analysis of data sets with missing values has evolved rapidly during recent years, standard statistical designs and generally accepted methods of compensation for case loss and nonresponse have not yet become available. Nevertheless, methods of compensation for missing data have been developed and used by Kalton (1983), Bound *et al.* (1986) and Little and Rubin (1987). These authors describe compensation methods that would appear particularly useful for longitudinal studies in which at least some auxiliary information is available for most observational units.

A basic distinction can be made in the compensation for missing data between two general classes of procedures, namely, weighting adjustment and imputation. Weighting procedures are mainly used to adjust the relative weights carried by sets of data across the units of observation at once, as would happen if population weights are used to compensate for total nonresponse. Imputation methods are employed in the correction of calculated statistics by assigning concrete values for missing data associated with the level of the individual record. Kalton (1983, p.19) writes that, while the distinction between weighting adjustments and imputation is used as the major classification category for

compensation methods, it should not be assumed that the two are unrelated because both operate in the same basic way of building up the respondents' data to represent the missing data. The main difference between weighting and imputation methods is that with the former the records for the respondent and the missing groups are merged into a single file with increased weight, whereas with the imputation method the two records remain separate.

A multistage procedure of compensation for missing data is used in this monograph. In this approach values for missing data are calculated using procedures that can be shown empirically to produce the most reliable estimate of a particular statistic. Controls are built into the multistage compensation approach, so that methods which produce less reliable estimates are rejected in favour of others that can be demonstrated to yield more accurate estimates of a given statistic, as indicated by the standardized difference between the variable mean scores of the sample and those of the master frame. Thus, the choice of compensation procedure depends by and large on the measurement properties of the items concerned and, in some situations, on the characteristics of the categories of nonobservation involved. The approach comprises three stages: restriction of the population, weighting adjustment, and multiple imputation.

Restriction of the Population

The main purpose of restricting the population under study is to achieve a target group that can be held constant over time, as opposed to the moving target design common to most longitudinal studies that otherwise would have to have been employed. Another aim is to draw cases from the master frame in such a manner that the group included can be considered to conform as closely as possible to a simple random sample drawn from the Malmö Study population which was defined in 1937 and 1938. In order to achieve these aims it is imperative that the new target group should be as representative as possible of the initial population with respect to classification variables such as home background and cognitive ability levels. That is, the target should be defined so that the biasing influences of differential selection of group members can be reduced or eliminated altogether. Hence, the sample would have to be drawn so as to include only observed cases with an absolute

minimum of missing values on all measures of interest in this study. The next stage is then to compensate for the effects of any remaining missing values by means of sample weighting adjustments and multiple imputation.

Figure 6.1 shows how two restricted target groups are derived from the master frame in addition to the original and unchanged population (Data Set 1, N=834). The second data set (Data Set 2, N=744) excludes the men who were deceased before or during 1984. Because the excluded group has been shown to have scored one-third of a standard deviation below average on the group intelligence test given in childhood (see Table 6.1), the target group associated with the measures involved in the second data set is not fully representative of the master frame. A second reduced data set is arrived at by excluding not only the men who have died but also those who were abroad in 1971 and 1984, those who have failed to declare an income at three or more consecutive points in time of data collection, and those who have not responded to any of the questionnaires used to gather information in the Malmö Study.

The multistage approach to missing data compensation entails that multiple imputation schemes are employed before weighting adjustments are applied to items in which the imputation methods have been shown to have failed in their estimation of reliable values to compensate for particular classes of missing data. However, in order to make it possible to evaluate the outcomes of compensation with respect to the quality of both univariate and multivariate statistics, comparison groups should be available. It is considered useful in this context to use three comparison groups. The three data sets arrived at in the process of population reduction are shown in Figure 6.1. With respect to missing data compensation, the Figure indicates that Data Set 1 contains raw scores including missing values on the original items derived from the Malmö Study. Figure 6.1 also shows that weights are used to adjust the sample statistics of Data Set 2 for the influences of missing data. By contrast, weighting adjustments are only employed as a last option in the compensation for missing values in Data Set 3. Thus, apart from the original scores, the third data set by and large contains imputed concrete scores for missing values of the measures employed in the analysis undertaken in this study. The procedures by which these scores are obtained are described below.

A relatively simple procedure is used to determine whether the units

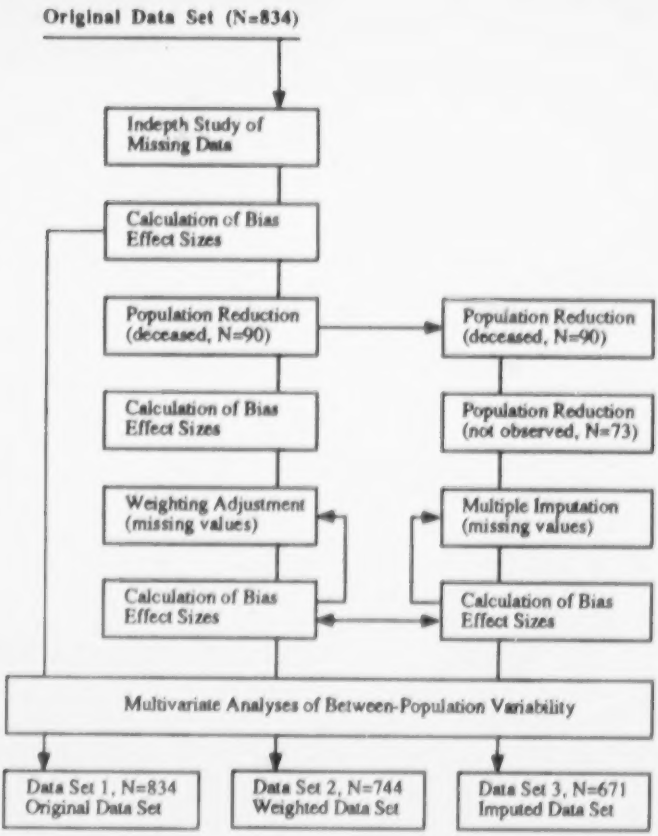
Original Data Set (N=834)
Indepth Study of Missing Data
Calculation of Bias Effect Sizes
Population Reduction (deceased, N=90)
Population Reduction (deceased, N=90)
Calculation of Bias Effect Sizes
Population Reduction (not observed, N=73)
Weighting Adjustment (missing values)
Multiple Imputation (missing values)
Calculation of Bias Effect Sizes
Calculation of Bias Effect Sizes
Multivariate Analyses of Between-Population Variability
Data Set 1, N=834 Original Data Set
Data Set 2, N=744 Weighted Data Set
Data Set 3, N=671 Imputed Data Set

Figure 6.1. Diagram showing the approach taken in the compensation for missing values in measures derived from the Malmö Study.

constituting the case bases of the restricted data sets are representative of the master frame. Because the case bases of the two reduced populations are held constant, it is not productive to compute representation indices at the item level. Table 6.3 presents the results of a comparison of the excluded groups and the master frame with respect to their mean

Table 6.3
Designations of three data sets derived from the Malmö Study

Characteristic	Data Set 1	Data Set 2	Data Set 3
Number of Cases (N)	variable	fixed (744)	fixed (671)
Missing Values	variable	none	none
Compensation Procedure	none	weighting	imputation
Selection Bias Index	$-0.28 < \delta < 0.29$	-0.31	-0.25
Representation Index	$0.96 < \gamma < 1.15$	1.04	1.06

Notes: (a) Cognitive ability in childhood (IQ38) is used as the control variable. (b) Selection bias indices (δ) denote the effect size of the standardized difference between the lost group and the master frame population (Base 1938). (c) Representation indices (γ) denote the degree of discrepancy between the actually surveyed group (achieved) and the master frame population (intended). (d) Indices with values in the ranges from -0.20 to 0.20 and 0.80 to 1.20 are not considered to be significant.

scores on one appropriate control variable. As expected, the effect sizes associated with the degree of selection bias in the three data sets are significant with values exceeding the threshold level. However, as can be seen from Table 6.3, the index associated with the third data set is the smallest of the three, which indicates that this data set is less vulnerable to selection effects than are the other two. Because an effect size with a value of -0.25 is indicative of only a small degree of disturbance, the population associated with Data Set 3 can be considered only slightly biased with regard to the distribution of cognitive ability levels in the actually achieved data set. Table 6.3 also shows that the representation indices (γ) associated with the cases involved in the items in Data Set 3 are not significant because they vary in size from 0.96 to 1.15. Furthermore, the representation indices comparing the sampled units in Data Set 2 and Data Set 3 with the original master frame are neither variable nor significant.

Even though the procedure used to select units from the master frame population does not conform to a sampling plan affording an exactly equal probability for units to be selected, the plan used in the identification of members for Data Set 3 can nevertheless be considered to have given a positive non-zero chance of inclusion to each chosen member. Because the units targeted in the third data set can be assumed to represent, at least to a degree, a random sample of the original master frame, the use of common statistical procedures for significance testing would seem defensible, not least because in this case inference would occur from a fully covered and efficient probability sample to a well-defined study population. Moreover, the use of a

finite population correction can be ignored if it is assumed that a wider population covering all similar groups over a larger time period is involved.

Compensation for Missing Data

The decision to proceed in this investigation from a mere analysis of missing data to actual compensation for the influences of missing data on particular sample statistics in the Malmö Study has been taken on the recommendation of Professor Karl G. Jöreskog from the University of Uppsala, Sweden, who was the principal developer of the LISREL technique of analysis used in the examination of the data. Extensive use was also made in the present investigation of a number of authoritative writings in the field of statistics concerned with methods and approaches for the handling of missing data problems in survey research (Kalton, 1983; Rubin, 1983; Little and Rubin, 1987; Rubin, 1987). The several approaches taken in this study to compensate for missing data are generally consistent with the strategies discussed by the authors mentioned above.

The following steps were taken in the calculation and use of weights for missing data compensation (see Figure 6.1). First, for each measure in which cases with missing values were encountered, indices of the degree of selection bias these lost cases could introduce in particular sample statistics were calculated. These effect size indices were then employed to find out if and how much the excluded men differed from the sampled and observed men for all other measures. Second, if meaningful discrepancies were found, then the between-group mean differences were used to derive weights for the calculation of compensation values either for the nonobservation group as a whole or, if appropriate, for different categories of nonresponse. Third, these weights were then used to compensate for missing values in the items. If the simple product moment correlation between an item and its control was less than 0.20 in magnitude, then all weighting schemes were abandoned and the grand mean scores on the variables were inserted for missing values instead. Supplementary Table A6.1 presents the weights and the associated mean scores used in the compensation of missing values in Data Set 2. The multiple imputation approach sought to arrive at the best possible estimate for a missing value at the level of the individual respondent. As opposed to the general purpose pro-

cedures of adjustment described above, which principally aimed to increase the weights of observational units in the different subgroups of the reduced population in order to compensate for differential response rates, multiple imputation schemes were used to single out the records of specific respondents and to fill in eventual gaps using auxiliary information available about that respondent. Hence, the first step was to create personal records for all men in the third data set so that any missing values could be placed in chronological order in a context of actually recorded values. Then, deductive imputation was used in those cases in which scores for missing values could be estimated from other relevant information listed on the respondent's record.

Within-group within-class imputation was employed if a missing value could be estimated from values recorded for a respondent on similar items over time. For example, if occupational status was known at times t=1, t=2 and t=4, and if additional information was at hand about that respondent's formal educational career and earnings profile, then an estimate could be made with regard to that respondent's most probable occupational status at time t=3. However, if educational attainment and income were unknown, then another approach had to be taken, for example, within-group mean score imputation at item level over time, or regression imputation was used. The latter procedure entailed that, if an established model was found from previous research that could guide the specification of the regression equations, then values predicted from the regression were inserted. This approach was taken in the compensation for missing values in father's income, teacher's ratings of intelligence and class standing, youth educational attainment, occupational status, and earnings.

A procedure referred to as "hot decking" by some authors in the field was used in the estimation of missing scores on the intelligence test administered by the military (Kalton, 1983). About one-third of the men for whom scores on the four subtests were not available had taken the test before or after 1948. Only total intelligence test scores were available for this group. The approach taken in these cases was to match pairs at random, so that the raw scores on the four test components of a respondent were transferred to another who had had the same total score but for whom scores on the subtests were missing. If such total scores were also missing, then matched identical pairs were formed on the basis of the test data collected in 1938. It is known from previous studies that home background and youth educational attain-

ment correlate strongly with intelligence test scores estimated at around 20 years of age (e.g. Husén, 1951; Härnqvist, 1968). Consequently, the procedure adopted was to match respondents not only in terms of cognitive ability at age 10, but also on the basis of identical home backgrounds and formal educational careers.

Because the validity and stability of indicators of attitudes, motivations, expressed interests, job satisfaction and well-being are issues of some controversy in the social sciences, it was considered too risky to formulate edit assumptions providing for the choice and application of procedures for the editing of missing data by compensation in qualitative measures. Instead of imputation, grand variable mean scores or, if appropriate, gross and domain weights (Kalton, 1983) were used in the estimation of compensation scores. These weighted scores then replaced missing values in qualitative types of variables.

It should be noted that edit constraints were used to prevent imputation outcomes in Data Set 3 that would result in large differences between the univariate statistics of the master frame and the new target. A threshold level equivalent to an effect size of 0.20 was used in the assessment of imputation outcomes at item level. As is indicated in Figure 6.1, if larger differences were found then the imputation method employed was considered faulty, and the estimation of scores to compensate for missing values was repeated using a more appropriate technique. Hence, because some measure of control was inherent in the approach taken, there is no compelling need to report effect size indices of the influences of multiple imputation on *univariate* population statistics.

Summary

In this chapter, separate analyses have been conducted in order to establish whether and how much different categories of case loss, such as mortality and unit noncoverage, and unit and item nonresponse have influenced the degree of representation of the response groups obtained in this study. The magnitudes of these influences were assessed and interpreted in terms of standardized differences in mean scores on a group intelligence test.

It was found that selection bias has decreased in importance over time, mainly because the biasing effects of mortality and other types of noncoverage have tended to cancel each other out later in the lives of

the men surveyed. The aggregate biasing influence of all categories of case loss and nonresponse encountered prior to 1963 was found to be small but significant. Moreover, the total disturbance effect of nonobservation before 1971 was of borderline significance. However, the biasing effect of case loss and nonresponse on the quality of the data achieved in the 1984 data collection was found not to be significant.

The approach to missing data compensation taken in this study comprised three stages, namely, population reduction, weighting adjustment, and multiple imputation. Three data sets were derived from the Malmö Study in the reduction process. Effect sizes of selection bias and representation were calculated for each data set, using scores on a group intelligence test as the control variable. Some use was made of this reference variable in the intermediate evaluation of the outcomes of imputation at the item level, so that outcomes which were significantly different from the master frame standard could be rejected. The result of this procedure was that the cases involved in Data Set 3 were found to be representative, at least to a satisfactory degree, of the population originally defined in the Malmö Study in 1937 and 1938.

However, some notes of caution are necessary. The effect sizes so far presented are calculated using one control variable. Even though this variable seems appropriate, the approach taken makes it impossible to find out whether the men who have been lost to the Malmö Study due to death or other reasons, differ from those who remain in the study with respect to other criteria of assessment. In an earlier analysis of missing data in the Malmö Study, which made use of a different analytical strategy from the one employed in the current investigation, Tuijnman and Fägerlind (1989) found no statistically significant differences in home background variables between the men surveyed in 1963, 1971 and 1984, and those who were not observed on these occasions of data collection. The importance of this finding notwithstanding, a second weakness of the approach so far taken in this report should be noted. Namely, the analyses do not take into account the fact that the influences of selection bias and differential nonresponse on regression coefficients can differ from their effects on variable mean scores.

This issue is brought up in the next chapter, which presents estimates of the consequences of missing data compensation for the validity of the data set investigated. Estimates of the effects of case loss and nonresponse on the reliability of the manifest variables employed in the subsequent LISREL analysis are also presented.

Chapter 7
Evaluation of Data Compensation in a Model of Youth Education

The preceding chapter highlighted some of the problems involved in the analysis of a longitudinal data set with missing values on many items. Even though a control variable was used both in assessing the consequences of case loss and nonresponse for the validity of univariate population statistics, and in evaluating the outcomes of missing data compensation, some analytical issues remain unsolved. One problem is that the effects of population reduction, weighting adjustments and multiple imputation should not only be examined by using estimates of group differences in variable mean scores across data sets, but also that other criteria and standards of assessment should be applied. These could include, for example, the reliability of the measurements made, the accuracy of standard errors and goodness of fit indices and, in particular, the capacity of the compensated data set to generate consistent estimates of parameters in structural equation models.

The purpose of this chapter is to examine the effects of the imputation procedures on the estimation of a model of youth educational attainment estimated by linear structural relations analysis and using similarly measured observed variables derived from the three data sets described in the previous chapter. Hence, because the same model is estimated by employing both original and compensated data, comparisons can be made with respect to the accuracy, reliability and meaningfulness of the variables involved in the weighted and imputed data sets in estimating the relationships hypothesized in the model.

Strategy for Comparison

In order not to complicate the analysis beyond the point where the making of comparisons would be very difficult, the following strategy was employed. On the basis of the survey of research presented in Chapter Four, a conceptual model of youth educational attainment was hypothesized (see Figure 4.1). This path model includes five constructs:

(1) home background, (2) cognitive ability, (3) home support for schooling, (4) rated disposition to learn, and (5) youth educational attainment. Before these theoretical variables were incorporated in the linear structural equations model, they were tested in exploratory models, by using similar measures derived from the three data sets. The solutions were compared and evaluated with regard to the magnitudes of factor loadings, parameter estimates, squared multiple correlations, and goodness of fit statistics. After an appropriate measurement model had been obtained in this way, the full LISREL model was fitted and the parameter estimates compared for the three sets of data. Because similar measures were used which had a large majority of cases in common, it was considered useful to compare not only the unstandardized coefficients but also the standardized estimates, in order to examine the effects of weighting and multiple imputation on both types of estimated coefficients.

An opportunity to evaluate the appropriateness of the reduced data sets arose in connection with the fitting to the model of the scores on the group intelligence test administered in 1938. Because the four test components were fully covered in the original data set, the model fitted to the test scores from Data Set 1 could therefore be regarded optimal in reducing estimation error. Hence, any change in the estimated reliabilities of the test components in measuring cognitive ability by using the weighted and compensated measures from the second and the third data sets could be interpreted as representing the influences of sampling error and statistical estimation error.

Analytical problems were encountered with respect to the estimation and comparison of other constructs in the model, because the measures in Data Set 1 contained missing values and also because weights had been used in the adjustment for missing data in the variables contained in the second data set. As a consequence, the use of polychoric and polyserial correlation coefficients as providing the basis for model testing would lead to a situation in which it would be difficult to examine the influences of missing data compensation in parameter estimates in the model. Furthermore, because raw score values and product moment correlations constituted the basis for the comparative analysis, some doubt would remain with respect to the accuracy of comparisons involving standard errors and measures of goodness of fit. Moreover, because most ordinal measures represented responses to sets of rank ordered scores, the use of raw score values in the calcula-

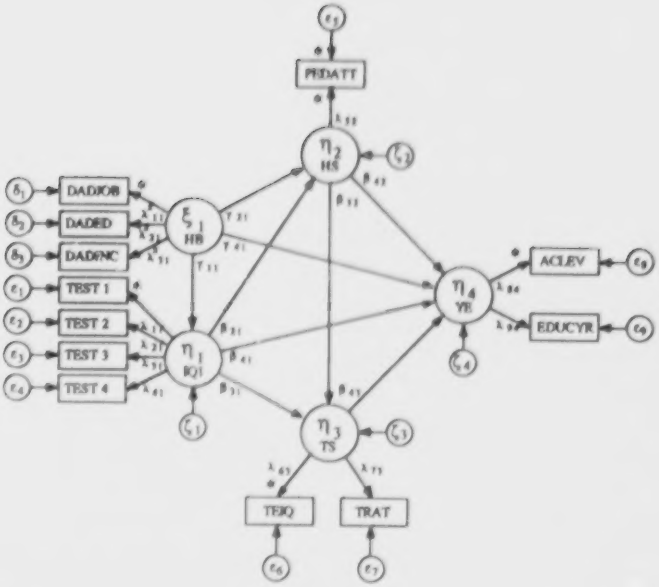

Figure 7.1. Path diagram for a hypothesized LISREL model of youth educational attainment.

Note: Table A5.1 and Table A5.2 give summary statistics for the measures specified in the model.

Where * indicates a fixed parameter;
ξ refers to an independent variable;
η refers to a dependent variable;
ξ_1 indicates home background (HB);
η_1 indicates cognitive ability assessed in childhood (IQ1);
η_2 indicates home support for schooling (HS);
η_3 indicates rated disposition to learn (TS);
η_4 indicates youth educational attainment (YE); and
γ refers to the regression of dependent on independent variables;
β refers to the regression of dependent on dependent variables;
δ refers to measurement error in an independent variable;
ϵ refers to measurement error in a dependent variable;
ζ refers to residual variance in a dependent variable; and

DADJOB denotes father's occupational status;
DADED denotes father's educational attainment;
DADINC denotes father's income;
TEST 1 denotes a subtest involving sentence completion;
TEST 2 denotes a subtest involving sentence restructuring;
TEST 3 denotes a subtest involving word opposites;
TEST 4 denotes a subtest involving figure perception;
PEDATT denotes parents' attitude to their child's schooling;
TEIQ denotes teachers' ratings of students' aptitude for learning;
TRAT denotes teachers' ratings of students' class standing;
ACLEV denotes level of formal youth education acquired;
EDUCYR denotes years of formal education received.

tion of correlation coefficients instead of normal scores would present a problem when maximum likelihood estimation procedures were applied to the correlation matrix. However, even though unsatisfactory from the point of view of statistical efficiency, with respect to the magnitudes of the estimated errors, this shortcoming would not influence the overall meaningfulness of the comparisons attempted.

The LISREL Model of Youth Educational Attainment

It is outside the scope of this monograph to provide a general discussion of the use of the linear structural relations analysis approach to model building. Figure 7.1 presents a path diagram for the hypothesized LISREL model of youth educational attainment. The purpose of presenting this path diagram is twofold. First, it serves as a basis for an understanding of the comparisons carried out, and second, it introduces the path diagram conventions used in this report. The methods used in linear structural relations analysis and its notation system are described in detail by, among others, Jöreskog and Sörbom (1977; 1988), Munck (1979) and Lindén (1986). The LISREL 7 (version 7.5B) computer program was used in the analysis of data undertaken in this investigation.

Figure 7.1 shows that home background (HB) is indicated by three measures, namely, father's education, father's occupation, and father's income. Even though several attempts were made to use mother's occupation and mother's income, each of these measures were found to have only a very weak factor in common with home background as assessed on the basis of the measures associated with the social position of the father. As a consequence, it was not possible to achieve a satisfactory model by employing these measures collectively as indicators of a single home background construct. However, despite the fact that the variables relevant to the mothers could not be entered into the linear structural relations analysis simultaneously with those related to the fathers, the measures that were actually used serve well in the identification and measurement of home background in a full structural equation model (see Table 7.1).

Difficulties were encountered neither in the fitting of the data involving test scores to the construct of cognitive ability, nor in the

estimation of the theoretical variable "disposition to learn," by employing the two measures of student aptitude and class standing. As was noted in Chapter Five, the reliability of the measure "home support for schooling" could, unfortunately, not be estimated, since only one appropriate indicator of the construct involved was obtained from the Malmö Study. However, in view of the purpose of the comparative analysis, this is not just a disadvantage from the perspective of accuracy and efficiency, but could also be considered as an advantage, mainly because it facilitates an understanding of the influences of missing data compensation on the regression coefficients in the model which is associated with this observed variable.

Youth educational attainment is measured by two variables, namely, years of schooling and level of formal education. Even though the fit of these variables to the model is adequate, the measurement error associated with acquired level of formal education cannot be estimated from the data (see also Figure 8.3). Hence, the measure "years of schooling received", which is the least reliable of the two, is not specified in the path model tested in the current chapter.

Analysis of Variability Across Data Sets

Table 7.1 presents maximum likelihood estimates of both standardized and unstandardized parameters and their t-values in three models of youth educational attainment. These models are fitted to similar measures derived from the three data sets. It should be mentioned that the estimates presented in Table 7.1 are not associated with just-identified and recursive models but with over-identified models. These modified models can be considered optimal in the sense that no significant improvement in their overall goodness of fit would be achieved by relaxing any of their parameter constraints (see also Table 7.3).

The factor loadings (λ) of the measures used to estimate the model of youth educational attainment are shown in Table 7.1. It can be seen from the values of the measurement errors (δ_1, δ_2 and δ_3) that the reliabilities of the three indicators used in the assessment of the independent variable, home background, are generally the same across the three models. It can also be inferred from the data recorded in Table 7.1 that the measurement errors (δ_4 through δ_8) associated with the dependent variables are generally invariant across the three data sets.

These results can be interpreted as showing that the strategies of missing data compensation used in the counteracting of the influences of nonresponse and case loss has not produced any marked bias, since the differences between the three models are generally small.

As was mentioned previously, there is no case loss associated with the measures of cognitive ability in childhood in Data Set 1. Hence it may be expected that the intelligence test scores in this data set are the most reliable and, because of the larger number of cases involved, also the most efficient in indicating the cognitive ability construct. The factor loadings and the t-values associated with these four observed measures (e.g. λ_1, λ_2, λ_3 and λ_4) disclose that this is indeed the case. However, because the variations across the three models in the size of the estimates are mostly trivial, it may be concluded that the men observed in Data Set 3 (N=671) constitute an unbiased sample of the cohort initially defined in the Malmö Study in 1937 and 1938, and, for the purposes of significance testing in LISREL analyses, may be considered as a simple random sample.

Inferences about the outcomes of missing data compensation can also be made on the basis of the magnitudes of the unstandardized path coefficients and t-values estimated in the models. The data in Table 7.1 show that the use of compensation procedures has had a trivial effect on the values of the paths connecting home support for schooling (HS) with rated disposition to learn (TS) and youth educational attainment (YE). The estimates recorded in Table 7.1 reveal that the t-values of the parameters obtained using the weighted measures from Data Set 2 are generally smaller than those estimated in Data Set 1, but larger than those generated by employing the measures derived from Data Set 3. It can also be seen that the measures in Data Set 3 are generally less efficient in producing asymptotically correct estimates of standard errors, probably because there are fewer cases involved.

Surprising results are obtained with regard to the measurement of rated disposition to learn. Probably because the number of committed cases is larger, the estimates indicate that the weighted and compensated measures of this construct which are derived from Data Set 2 and Data Set 3 are, for the most part, less prone to measurement error than those originally collected in the Malmö Study. Moreover, the measures associated with Data Set 3 show the highest reliability. Hence, the path coefficient found for the regression of youth educational attainment (YE) on rated disposition to learn (TS) has a lower value when estimat-

Table 7.1

Variability in parameters estimated in the model of youth educational attainment (Figure 7.1) across three data sets (standardized estimates β, unstandardized estimates B, t-values t)

Parameter	Model A Data Set 1			Model B Data Set 2			Model C Data Set 3		
(*=Fixed)	β	B	t	β	B	t	β	B	t
Loadings of three indicators on home background:									
λ (1,1)	0.88	1.0*	n.a.	0.84	1.0*	n.a.	0.87	1.0*	n.a.
λ (2,1)	0.74	0.84	16.7	0.73	0.87	13.9	0.76	0.86	15.4
λ (3,1)	0.61	0.69	18.3	0.58	0.69	14.4	0.64	0.73	19.2
Errors and covariances associated with indicators of home background:									
δ (1,1)	n.a.	0.22	5.5	n.a.	0.29	6.1	n.a.	0.24	5.5
δ (2,2)	n.a.	0.45	12.7	n.a.	0.46	11.3	n.a.	0.43	11.1
δ (3,3)	n.a.	0.63	14.8	n.a.	0.66	14.1	n.a.	0.59	12.8
δ (3,1)	n.a.	0.10	3.1	n.a.	0.04	1.0	n.a.	0.15	4.1
Loadings of eight indicators on four dependent variables:									
λ (1,1)	0.84	1.0*	n.a.	0.82	1.0*	n.a.	0.82	1.0*	n.a.
λ (2,1)	0.79	0.93	24.5	0.77	0.94	21.6	0.76	0.93	19.9
λ (3,1)	0.69	0.82	20.9	0.68	0.83	18.8	0.69	0.85	18.0
λ (4,1)	0.61	0.72	18.1	0.58	0.71	15.7	0.57	0.70	14.6
λ (5,2)	n.a.	1.0*	n.a.	n.a.	1.0*	n.a.	n.a.	1.0*	n.a.
λ (6,3)	0.92	1.0*	n.a.	0.93	1.0*	n.a.	0.94	1.0*	n.a.
λ (7,3)	0.69	0.75	19.2	0.70	0.76	17.7	0.73	0.78	19.3
λ (8,4)	n.a.	1.0*	n.a.	n.a.	1.0*	n.a.	n.a.	1.0*	n.a.
Errors associated with the indicators of the dependent variables:									
ε (1,1)	n.a.	0.29	12.8	n.a.	0.32	12.4	n.a.	0.34	12.1
ε (2,2)	n.a.	0.38	15.4	n.a.	0.41	14.5	n.a.	0.43	14.1
ε (3,3)	n.a.	0.52	17.7	n.a.	0.54	16.5	n.a.	0.52	15.5
ε (4,4)	n.a.	0.63	18.6	n.a.	0.66	17.7	n.a.	0.67	16.8
ε (5,5)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ε (6,6)	n.a.	0.16	4.8	n.a.	0.14	3.9	n.a.	0.11	3.3
ε (7,7)	n.a.	0.52	16.8	n.a.	0.51	15.1	n.a.	0.46	14.4
ε (8,8)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Regression of dependent on dependent variables:									
β (2,1)	0.17	0.20	4.5	0.15	0.18	3.5	0.15	0.18	3.4
β (3,1)	0.73	0.80	20.1	0.71	0.80	18.0	0.74	0.85	18.0
β (4,1)	0.19	0.23	3.6	0.26	0.31	4.7	0.24	0.30	4.2
β (3,2)	0.12	0.11	4.2	0.12	0.11	3.6	0.13	0.12	4.1
β (4,2)	0.18	0.18	6.1	0.21	0.21	5.5	0.16	0.16	4.9
β (4,3)	0.25	0.28	4.7	0.16	0.18	3.1	0.20	0.21	3.5
Regression of four dependent variables on home background:									
γ (1,1)	0.36	0.35	8.5	0.34	0.33	7.3	0.33	0.31	6.9
γ (2,1)	0.37	0.42	9.0	0.31	0.37	7.0	0.36	0.41	7.8
γ (4,1)	0.35	0.39	9.5	0.34	0.40	8.6	0.39	0.45	9.8

continued

Parameter (* = Fixed)	Model A Data Set 1 β	B	t	Model B Data Set 2 β	B	t	Model C Data Set 3 β	B	t
Residual variance in the four dependent variables:									
ζ (1,1)	0.87	0.62	13.7	0.88	0.60	12.4	0.89	0.59	11.7
ζ (2,2)	0.79	0.79	19.5	0.85	0.85	18.6	0.82	0.82	17.6
ζ (3,3)	0.39	0.33	8.7	0.44	0.37	8.6	0.39	0.35	8.5
ζ (4,4)	0.46	0.46	18.5	0.50	0.49	17.5	0.45	0.45	16.3

Notes: (a) The parameters indicated in the table are shown graphically in the path diagram included in Figure 7.1. (b) The significance level for t is 2.0. (c) t-values should be interpreted carefully because, in some cases, there is evidence of a departure from a bivariate normal distribution. However, it is considered that the meaningfulness of the comparison is not invalidated. (d) δ (3,1) denotes an error covariance term between father's occupational status and father's income.

ed in the model based on Data Set 3 than the one associated with Data Set 1 (e.g. $\beta_1(4,3)-\beta_2(4,3)=-0.07$). This result is probably not indicative of worse modelling capacity, but reflects a real substantive finding.

Table 7.2 presents indices of the goodness of fit of the model of youth educational attainment to the measures derived from the three data sets. Because identical models are estimated, the degrees of freedom are the same across the models. Hence, because the values of χ^2 are substantially smaller in the models estimated using the weighted and compensated data sets than in the model fitted to measures derived from Data Set 1, it can be inferred that missing data compensation has greatly enhanced the overall efficiency of the data analysis. Moreover, the probability estimates (0.01, 0.31 and 0.34) indicate that the most appropriate fit of the model to the data is obtained by using the measures derived from the compensated, third data set. Since the model fitted to Data Set 3 evidences the best overall goodness of fit (see Table 7.2), the parameters estimated in this model are considered to be generally more accurate than those found in the other two models.

In summary, the results of the comparative analysis show that the measures included in Data Set 3 perform as well as, or in some instances better than, both the weighted measures in Data Set 2 and the unadjusted variables in Data Set 1 with respect to the following criteria of assessment: (1) the estimated magnitude of representation and selection bias, (2) the reliability of the observed measures, (3) the overall goodness of fit of the model to the data, and (4) the admissibility of the data set to the use of inferential methods of statistical analysis, including conventional procedures for significance testing.

In view of these advantages, it is considered appropriate to adopt the

Table 7.2
Comparative measures of the goodness of fit of the model of youth educational attainment to each of the three data sets

Measures of goodness of fit:	Model A	Model B	Model C
Chi-square	59.11	39.80	38.95
Degrees of Freedom	36	36	36
Probability	0.01	0.31	0.34
Adjusted Goodness of Fit Index	0.98	0.98	0.98
Root Mean Square Residual	0.02	0.02	0.02

Notes: (a) Model A is estimated using variables derived from Data Set 1. (b) Model B is estimated using variables derived from Data Set 2. (c) Model C is estimated using variables derived from Data Set 3.

general approach in this study to estimate the models developed in subsequent chapters using the compensated measures contained in Data Set 3. However, a reservation should be made in this connection, since the justification for this approach is principally based on the results obtained in an analysis of data that was restricted to comparisons between parameters estimated in path models involving measures whose case bases are, from the outset, relatively well-covered. Hence, the appropriateness and utility of the approach taken cannot be confirmed with respect to the adequacy of the weighting schemes and multiple imputation procedures which have been used in the compensation for missing data in measures obtained either from the questionnaires or the public registers. However, in spite of this limitation, the results so far procured would seem to suggest that the approach taken in this investigation, namely to employ the measures in Data Set 3 also in the testing of path models incorporating other observed variables, is appropriate.

Issues in the Estimation and Modification of the Model

The stages taken in the estimation and modification of the model of youth educational attainment are summarized in Table 7.3. It can be inferred from the values of χ^2 relative to the degrees of freedom that it is not achievable to improve significantly the fit of the model estimated under hypothesis *H3* by relaxing one or more of the parameter constraints in the model. This is so because the drop in χ^2 from hypothesis

H3 to *H4* (2.91) can be shown to be not significantly different from the expected value of 1.0 and, hence, since the apparent improvement of the model is obtained by "capitalizing on chance". However, some assumptions underlying the use of the maximum likelihood method are relaxed under hypothesis *H5*. Here, another iterative method is used, namely, the method of weighted least squares. The maximum likelihood method has been shown to be reasonably robust against deviations from multivariate normal distributions (Jöreskog and Sörbom, 1988). If the distributions deviate far from normality, however, then the χ^2 values obtained under maximum likelihood can be inflated. In this situation, correct standard errors and goodness of fit statistics can still be obtained in the LISREL 7 computer program with the use of the weighted least squares method (Jöreskog and Sörbom, 1988).

The probability indices in Table 7.3 explain that the use of the weighted least squares method substantially improves the goodness of fit of the model to the data (see *H5*). However, the use of this analytical strategy is not entirely free of problems. The finding that the degrees of freedom exceed the value of χ^2 under hypothesis *H5* suggests that overfitting or overestimation may have occurred in this case. For this reason, the weighted least squares method is not employed in the estimation of LISREL models in subsequent chapters. As a result, the several analyses carried out in the present investigation are based on the following *assumptions*. First, it is assumed that the maximum likelihood method generates accurate parameter estimates and correct standard errors in the models fitted to the compensated measures involved in the third data set. Second, it is assumed that minor deviations from multivariate normal distributions will not influence the results in any substantive way. Third, it is assumed that inferences made from the goodness of fit indices associated with the models estimated in this report are correct. This assumption would appear reasonable, not least in view of the t-values reported in Table 7.2, which suggest that the values of χ^2 associated with the three models of youth educational attainment are likely to be inflated. Hence, the measures of goodness of fit obtained in the estimation of several different structural equation models can probably be considered to be lower-bound estimates of the "true" values of these test statistics.

Table 7.3
Stages in the modification of the LISREL model of youth educational attainment (Data Set 3, N=671)

Hypotheses		Df.	χ^2	p
H0	Estimation of a fully recursive and just-identified model. Youth educational attainment is indicated by two measures, as shown in Figure 7.1;	45	94.66	0.00
H1	Estimation of a fully recursive and just-identified model. Youth education is indicated by one measure, namely, level of formal education (ACLEV);	36	49.94	0.06
H2	Same as under H1. The path from home background to rated disposition to learn (0.06) is removed because it is not significant (its t-value is 1.64);	37	52.60	0.05
H3	Same as under H2. Includes an error covariance term between father's occupation and father's income;	36	38.95	0.34
H4	Same as under H3. Includes an error covariance term between two subtests;	35	36.04	0.42
H5	Same as under H3, but estimated using polychoric and polyserial correlations and method of weighted least squares rather than product moment correlations and the maximum likelihood method.	36	27.41	0.85

Notes: (a) Df. refers to degrees of freedom. (b) The threshold for significance is commonly set at the 10 per cent of probability level. (c) The improvement in the goodness of fit of the model estimated under H4 is obtained by capitalizing on chance, since the drop in χ^2 of 2.91 from H3 to H4 with 1 degree of freedom is less than the critical value for significance of 3.25.

Discussion of Findings

The path diagram in Figure 7.2 shows standardized path coefficients estimated in a model of youth educational attainment. These estimates were generated by fitting the model indicated under hypothesis *H3* in Table 7.3 to the measures involved in Data Set 3. It can be seen from the figures reported in Table 7.3 that the goodness of fit of the model to the data is adequate. This conclusion is justified because the probability (0.34) that the parameters estimated in the model are not significantly at variance with the correlation matrix exceeds the 10 per cent (0.10) level of significance.

It can be inferred from the findings presented in Figure 7.2 that home background explains 11 per cent of the variance in the construct of cognitive ability (e.g. $1 - 0.89 = 0.11$). The data also indicate that the value of the standardized path coefficient estimated for this relationship is 0.33. Relative to the effects of home background on both home support for schooling (0.36) and youth educational attainment (0.39),

the environmental influence of home background on cognitive ability should be considered substantial.

Several authors have focussed on the importance of the home of origin in influencing children's experiences of schooling and their educational life chances (DiMaggio, 1982; Lareau, 1987; Coleman, 1988). In accordance with this theoretical perspective, it is argued (see Chapter Four) that the interest taken by the parents in their children's educational careers has a positive influence on formal educational attainment, even after variations in home background are held constant (see Teachman, 1987 p. 549). The findings presented in Figure 7.2 support this hypothesis, since both home background (0.39) and home support for schooling (0.16) are found significantly to influence youth educational attainment. However, the path coefficients indicate that the effect of home background is the more important of the two. The results also show that home background influences the attitudes of the parents with respect to their children's school careers more than does the children's measured cognitive ability, namely 0.36 and 0.15, respectively. This result clearly shows that children from relatively well-off homes have a good chance of being equipped with high expectations concerning their schooling, while objectively brighter children from poorer homes are likely to receive relatively less support and encouragement from their parents to do well in school. However, because home background (HB) and cognitive ability (IQ1), collectively, explain only 18 per cent of the variance in home support for schooling (HS), other important factors must be implicated in the relationships investigated.

Another issue of substantive interest in this study concerns the question of whether home background is related to differences in the way teachers evaluate their students' disposition to learn (TS). In this case, the hypothesis is that parents who express a relatively higher level of ambition with respect to the schooling of their children (HS) will seek ways to offer their children an educational advantage by interacting with their children's teachers. Thus, it is hypothesized that the parents, in unspecified ways, influence teachers' assessments of student aptitude for learning (TS). Lareau (1987) shows that teachers interpret parental involvement as a reflection of the value parents place on the educational success of their children. Hence, it can be hypothesized that the attitudinal dimension of the home environment (HS) should be implicated in the relationship between the assessment of student learning in

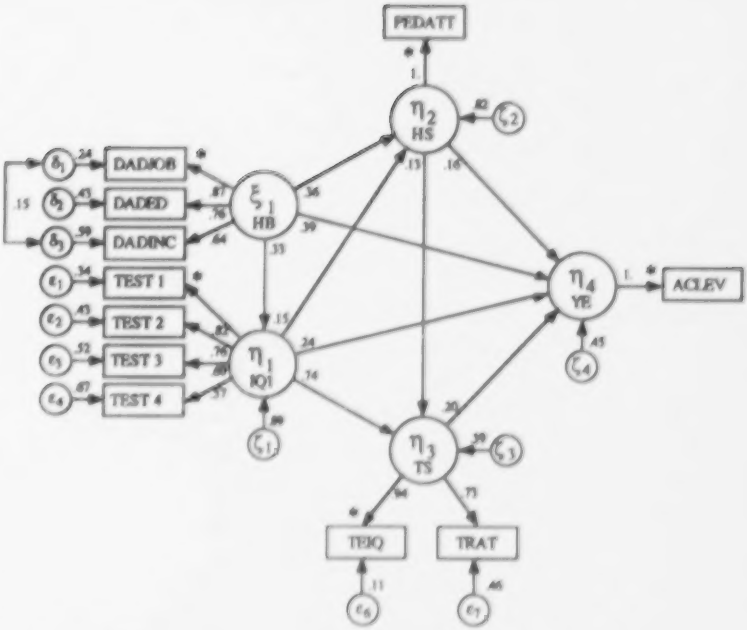

Figure 7.2. Parameter estimates in a LISREL model of youth educational attainment.

Notes: (a) Data Set 3, N=671. (b) All parameters shown are statistically significant at the five per cent level. (c) Maximum likelihood, standardized solution. (d) The goodness of fit of the model to the data is adequate (χ^2 is 39.0 with 36 degrees of freedom and probability 0.34).

Where * indicates a fixed parameter;
- ξ_1 indicates home background (HB);
- η_1 indicates cognitive ability in childhood (IQ1);
- η_2 indicates home support for schooling (HS);
- η_3 indicates rated disposition to learn (TS); and
- η_4 indicates youth educational attainment (YE); and

DADJOB denotes father's occupational status;
DADED denotes father's educational attainment;
DADINC denotes father's income;
TEST 1 denotes a subtest involving sentence completion;
TEST 2 denotes a subtest involving sentence restructuring;
TEST 3 denotes a subtest involving word opposites;
TEST 4 denotes a subtest involving figure perception;
PEDATT denotes parents' attitude to their child's schooling;
TEIQ denotes teachers' ratings of students' aptitude for learning;
TRAT denotes teachers' ratings of students' class standing;
ACLEV denotes level of formal youth education acquired.

the classroom (TS) and the students' eventual educational attainments (YE). Provided that home background and parental expectations with regard to schooling are causally related, it can also be hypothesized that home background influences the teachers' ways of assessing student aptitude for learning only indirectly, mediated by parental expectations. The results obtained in the testing of these hypotheses, which are also indicated in the path diagram shown in Figure 7.2, are commented upon in the passages that follow.

The results provided in Figure 7.2 show that cognitive ability (IQ1) and home support for schooling (HS) explain 61 per cent of the variance in rated disposition to learn (TS). However, the influence of the parents (0.13) is small compared with the influence of cognitive ability (0.74). Thus, even though the attitudes and expectations of the parents have significantly influenced the teachers' assessment of their students' aptitude for learning, the value of the parameter estimate found for the direct effect of cognitive ability on rated disposition to learn indicates that the teachers are fairly accurate, professional, and unbiased in their judgement. As a result, even though parental expectations would seem to make a small difference with respect to the assessments of students by their teachers, the *indirect* influence of the attitudinal dimension of the home on youth educational attainment mediated by teacher assessments in the classroom is trivial ($0.13 \times 0.20 = 0.03$). It follows that the hypothesis that parents influence the way teachers assess their students is supported by the findings. However, the related hypothesis, namely the one postulating that this parental influence also produces a significant indirect effect in addition to the direct effect of 0.16, as mediated by teacher assessments, on the level of youth education acquired, is rejected. Even though, this finding does not in any way deny the significance of each of the paths considered separately.

The causal network of influence associated with the antecedent factors explains 55 per cent of the variance in youth educational attainment. In comparing the relative sizes of the path coefficients, it can be seen that home background is the most important determinant of youth educational attainment (0.39). The important role of the parents and the teachers in influencing educational attainment is underscored by the finding that the path coefficient associated with the direct effect of cognitive ability is 0.24, while the effects of home support and rated disposition to learn are not much less in magnitude, namely 0.16 and 0.20 respectively.

Table 7.4

Total (TE), direct (DE) and indirect (IE) effects of four theoretical antecedent variables on youth educational attainment (Data Set 3, N=671)

Explanatory Variables	Effects on Youth Educational Attainment					
	TE	s.e.	DE	s.e.	IE	s.e.
Home Background (HB)	0.68	(0.05)	0.45	(0.05)	0.23	(0.03)
Cognitive Ability, age 10 (IQ1)	0.51	(0.05)	0.30	(0.07)	0.21	(0.05)
Home Support for Schooling (HS)	0.18	(0.03)	0.15	(0.03)	0.03	(0.01)
Rated Disposition to Learn (TS)	0.21	(0.06)	0.21	(0.06)		n.a.

Notes: (a) s.e. denotes the standard error of the unstandardized parameter estimate. (b) Maximum likelihood, unstandardized solution. (c) The effect size coefficients recorded in this table are unstandardized maximum likelihood estimates.

Table 7.4 presents estimates of the total and indirect effects of the antecedent variables on youth educational attainment. For an explanation of total effect coefficients, see Duncan (1975). Table 7.4 also presents the correlation coefficients which, if squared, indicate the degree of association between each antecedent factor and the dependent variable. These coefficients can be considered optimal because they represent the correlations among the latent variables and are estimated with significant measurement errors and error covariances accounted for in the model.

It can be seen from the effect coefficients recorded in Table 7.4 that home background (HB) and cognitive ability (IQ1) exert substantial indirect effects on the dependent variable of youth educational attainment (YE), namely, 0.23 and 0.21, respectively. As a consequence, their total effects on youth educational attainment are large (0.68 and 0.51). The importance of the home environment, broadly defined, in determining youth educational attainment exceeds in magnitude the influence of the childrens' measured intelligence. In accordance with previous research in this area (Keeves, 1972; Alwin and Thornton, 1984; de Graaf, 1986), the findings indicate that the attitudinal dimension of the home exerts a significant positive effect on youth educational attainment, even when home background factors of a socioeconomic type are held constant. Moreover, the findings indicate that teacher assessments of student aptitude is a significant factor which contributes to explaining differences in youth educational attainment.

The dominant influence of home background on youth educational attainment is attributable, at least in part, to the magnitude of the indirect effects of home background, as mediated by cognitive ability

and parental attitudes. It should be noted that the total effect estimated for the influence of home background on youth educational attainment (0.68) exceeds in magnitude the value of the correlation coefficient (0.59). While this result could imply an error in the measure of home support for schooling, it could also have arisen because home background is the only independent variable in the model. In this case the LISREL 7 estimate of the standardized regression coefficient is a correlation coefficient (Jöreskog and Sörbom, 1988).

Summary

This chapter has assessed the outcomes of the strategy adopted in the reduction of the population originally defined in the Malmö Study in 1937 and 1938, as well as in the compensation for missing data, with respect to several criteria. Included among these are the reliabilities of the measures, the magnitudes of the path coefficients and the coefficients of determination, and the goodness of fit of the models to the data sets. The analytical approach has been to compare the parameter estimates across three conceptually identical path models, which have been fitted by using three data sets, namely, the measures from the original Malmö Study (Data Set 1), the weighted measures in Data Set 2 and the compensated measures in Data Set 3.

The conclusion drawn from this comparative analysis has been that the measures involved in Data Set 3 are for the most part as reliable as, or in certain cases more reliable, than those associated with the other two data sets. The measures associated with Data Set 3 have also been shown to be the most useful in estimating a model of youth educational attainment using linear structural relations analysis. As a consequence, it is considered appropriate to retain Data Set 3 for use in further analysis involving other variables and path models.

In conclusion, the following results were obtained in the fitting of a LISREL model of youth educational attainment to the third data set. First, the influence of home background on youth educational attainment was found to be positive, substantial, and generally larger than the total influence of cognitive ability. Consistent with some theoretical models concerned with the role of attitudinal and cultural factors connected with the home environment in influencing childrens' school careers (Keeves, 1972; de Graaf, 1986), a measure of home support for

schooling was found to influence significantly youth educational attainment. Furthermore, the hypothesis that teachers exert an influence on their students' educational careers was supported. Because a half of the variance in the criterion variable, youth educational attainment, has not been accounted for by the factors included in the analysis, it must be concluded that there probably are other factors of importance which contribute toward the explanation and prediction of youth educational attainment.

As can be seen from Figure 4.1 and Figure 4.2 in Chapter Four, the five theoretical variables and their relationships, which are included in the model of youth educational attainment estimated in the current chapter, serve as the conceptual basis for the hypothesized model predicting participation in adult recurrent education. Accordingly, the latter model can be interpreted as comprising two parts, one concerned with the influences of the four antecedent factors on youth educational attainment and the other dealing with the effects of the various predictor variables on participation in programs of adult education. The main purpose of the following chapter is to test models of this type.

Chapter 8
Who Took Part in Adult Recurrent Education?

Since the 1960s, the expansion of adult education has constituted a central feature of reform in Swedish education (Tuijnman, 1989b). Chapter Three has described how successive governments in Sweden have deliberately set out to enhance the equity and efficiency of developing and utilizing human resources in the Swedish welfare society by promoting a more flexible combination of education, work, and leisure over the adult life span. One result of this policy has been that recruitment to programs of adult education has increased tremendously. Even though the goal of promoting equality of opportunity seems to have lost some of its appeal internationally in recent years, the equality issue is still central to social and educational policy in Sweden, mainly because social equality is at the core of a national welfare ideology.

The expansion of adult education and, more recently, the growth of in-service training, have raised potentially controversial questions regarding the distribution and impact of adult education. As mentioned in Chapter One, the critical issue is whether adult education will overcome social and economic inequality or will tend to deepen already existing disparities between different social strata. According to the Swedish Parliament, one important goal of adult education in a system of recurrent education is to promote social equality by reducing the gaps in educational access, participation and outcomes among groups and generations in Sweden.

In accordance with the second aim of this investigation, which was stated in full in Chapter One, the purpose of the current chapter is to study the antecedent factors influencing participation in programs of adult education. In pursuing this aim, the chapter seeks to investigate the social background and personality characteristics of the men surveyed in the Malmö Study cohort who were *not* participating in adult education programs during the period from 1958 to 1984. A third purpose is to develop a model of the recurrent education cycle. The parameters estimated in this model are then used to address the question whether, and to what extent, adult education, by offsetting differ-

ences in educational background, reduced the gap in formal educational attainment between the initially poorly-educated and well-educated groups in the cohort investigated.

Trends in Recruitment and Participation

While the measurement and comparison of youth educational attainment over time and across age cohorts is beset with many difficulties, this is even more true of the quantification of adult recurrent education. The different indicators of participation in adult education are described in Chapter Five and are, in the main, not repeated here. Table 8.1 records a cross-classification of the cohort for the number of years of formal schooling initially received, which constitutes a straightforward measure of educational background, with the three participation variables which measure whether the men had taken part in some program of adult education during any of the three intervals in time studied.

The results presented in Table 8.1 show that the group of men who had not taken part in an adult education program is larger than the group of participants in Period 1 from 1958 to 1963 (30 to 35 years of age). However, the groups involved did not differ much in percentage terms, namely, 54 and 46 per cent. The second section of Table 8.1 shows that, during the mid-career period from 36 to 43 years of age (Period 2), the relative share of nonparticipants decreased. A little less than half of the men in the Malmö cohort did not receive further education or training during this period of their lives. It has been mentioned earlier that the provision of adult education expanded rapidly in Sweden from the 1970s to the mid-1980s, the period covered by the third section of Table 8.1. Despite this enrolment increase, the cell entries indicate that one-third of the men followed up in the Malmö Study did not receive any adult education at all from 44 to 56 years of age (Period 3), while approximately two-thirds of the cohort did. The trend emerging from the data is clear. The relative number of the men who were not recruited to programs of adult education decreased with increasing age, presumably not because of their increasing age but because of the nature of national policies for the expansion of the adult education system.

This result is important because national enrolment statistics col-

Table 8.1
Participants (Part) in adult recurrent education and nonparticipants (Nonp) by formal educational background

Educational Background Category	N	%	Period 1 Nonp %	Period 1 Part %	Period 2 Nonp %	Period 2 Part %	Period 3 Nonp %	Period 3 Part %
< 8 Yrs	347	51.7	35.2	16.5	32.0	19.7	22.7	29.0
8–10 Yrs	178	26.5	10.9	15.6	9.2	17.3	8.2	18.3
11–14 Yrs	101	15.1	5.1	10.0	3.0	12.1	2.2	12.9
> 15 Yrs	45	6.7	3.1	3.6	2.1	4.6	1.2	5.5
Total	671	100.0	54.3	45.7	46.3	53.7	34.3	65.7
Gini Coefficient			0.13	0.16	0.19	0.16	0.16	0.08
Chi-square			57.34		76.33		37.24	
Phi Coefficient			0.29		0.34		0.24	
Probability			<0.001		<0.001		<0.001	

Notes: (a) Years of formal education is the classification variable. (b) The percentage distribution of participants and nonparticipants is given for each category of the classification variable. (c) Data include all programs of adult education and training. See Chapter Five. (d) Rounding errors have occurred. (e) Periods refer to the time intervals over which participation is measured. Period 1 covers age 30 to 35. Period 2 covers age 36 to 43. Period 3 refers to participation from age 44 to 56. (f) It is not possible to evaluate the outcomes of missing data compensation in the measures of adult recurrent education. However, it is assumed that the measures are less prone to error than would have been the case if no adjustments had been made.

lected in Sweden generally indicate that the older age groups participate in adult education to a lesser extent than do younger age groups (SCB, 1988c; Sundin and Tuijnman, 1988). However, it must be recognized that certain important differences exist between national statistics and those of the Malmö Study. These occur because the former are based on data collected in cross-sectional studies of the adult population in Sweden, either in connection with the labour force surveys or the quality of living investigations, while the latter data pertain to only one cohort followed over time. The implication to be drawn from the evidence is that the recruitment increase observed in the Malmö Study almost certainly reflects the marked expansion of adult education in Sweden during the past quarter century. Hence, because the men studied here may not have enjoyed the same favourable opportunities to receive adult education as more recent age cohorts, the results presented in the passages that follow should be interpreted carefully if comparisons are being made with data from other cohorts. However, because recruitment was probably more selective and discriminatory at the time when the system was less developed, and because those

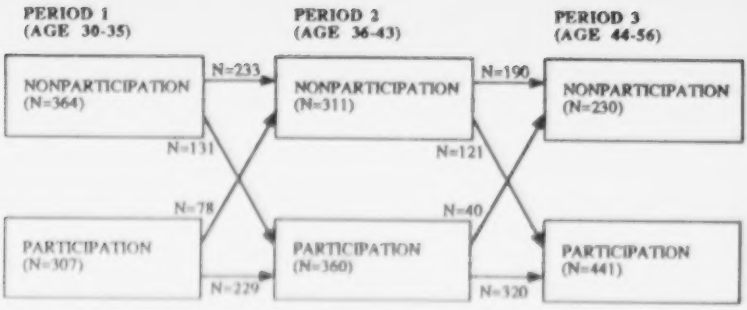

Figure 8.1 Participation in adult recurrent education, outflow distributions (numbers).

Notes: (a) Data include all programs of adult education and training. (b) Periods refer to the time intervals over which participation is measured. (c) Data Set 3, N=671.

recruited to adult education tended to be more homogeneous with respect to social and demographic background factors, it is possible that the outcomes of adult education are more readily noticeable in data pertaining to older age cohorts.

Table 8.1 also presents a breakdown of men who took part in adult education and men who did not with regard to the number of years of formal schooling they received initially. Most men who had received less than eight years of schooling did not take part in adult education from age 30 to 35 (Period 1) and from 36 to 43 years of age (Period 2). Moreover, the estimates show that the distribution becomes slightly more equitable with regard to the participation rate of this poorly-educated group during the period from 44 to 56 years of age (Period 3). However, with respect to overall participation in adult education, the situation did not become more equitable, since the relatively well-educated men had increased their participation more than the poorly-educated men. This point can be established with the use of the Gini coefficients shown in Table 8.1. Furthermore, the summary statistics and significance test results reported at the foot of Table 8.1 indicate that the relationships between youth education and subsequent participation in adult education are not due to chance. The phi coefficients, which denote the differences between the observed and the expected cell frequencies, are highly significant, namely 0.29, 0.34 and 0.24 respectively.

Figure 8.1 shows that 364 (54%) of the men studied did not participate in adult education during Period 1, from 30 to 35 years of age. Of

these men, 233 (64%) were not recruited during the subsequent period either. Of the men who took part in adult education initially, only 78 (25%) did not participate during the second period over which adult education is measured, while 229 (75%) men did. Figure 8.1 also indicates that 190 (61%) of the 311 men who were not involved in adult education during the period from 36 to 43 years of age did not take part from 44 to 56 years of age either (Period 3). By contrast, of the 360 men who received adult education from 36 to 43 years of age during Period 2, not less than 320 (89%) took part also from age 44 to 56 in Period 3.

It can be inferred from Table 8.1 that the cumulative share of the nonparticipants from Period 1 to Period 2 (age 30 to 43) is 35 per cent. Furthermore, Table 8.2 indicates that 155 men (23%) were not involved in adult education during the time interval which covers all three periods. Hence, the central finding emerging from the data is that one in every four men surveyed in the Malmö Study did not receive any adult education from 30 to 56 years of age. While previous studies have generally shown that recruitment to adult education is unequal in certain respects, these studies have probably taken insufficient account of the recurrent nature of participation. The data flows of participants and nonparticipants in Figure 8.1 would seem to indicate that perpetuation is a more prevalent phenomenon than change. That is, the majority of the people who did not take part during an early period did not participate during a subsequent period either, while most of those who took part in adult education initially were also found in this category during a subsequent period.

This finding has several important implications for educational policy in general, and for research into the antecedent factors and outcomes of participation in adult education in particular. The implications for research are fairly straightforward. First, the usefulness of employing a standard, cross-sectional data set in research aimed at explaining participation in adult recurrent education seems questionable, since this approach precludes the adequate measurement of dependent variables which take the dynamic nature of participation into account. Second, in investigating the outcomes of adult recurrent education, the use of a long time perspective seems appropriate and advantageous.

With respect to the policy dimension, it can be reasoned that the difficulty of recruiting people to adult education is, at least to a large extent, one of enlisting those who have not previously taken part. It could be surmised that the extension of adult educational opportunities

to a wider audience would not necessarily guarantee a great increase in the participation of individuals who have not partaken previously. This could be the case because there are barriers to participation, for example psychological ones, which are not immediately related to social and educational opportunity (Cross, 1981). It is worthwhile in this connection to mention the role of education and training in working life. Figure 8.1 shows that a significant number of men were found to have changed their enrolment status between two subsequent periods. Many nonparticipants who became participants during a subsequent period took part not in general adult education but in an educational program closely connected with the operations of the workplace. An explanation for this could be that the decision to participate in such education is often not taken exclusively by the employee concerned. Colleagues, labour union officials and, not least, employers, also influence this decision. Hence, nearness to the program could be an important factor in explaining why many individuals without prior experiences of adult education are recruited to educational programs in working life. Thus, the widening of participation in systematic programs of human resource development in the workplace could contribute to encouraging people who have not previously participated in adult education to partake. The implication is that the links between workplace education and public adult education deserve more careful research attention.

In view of the positive associations between youth education and recurrent participation in adult education as shown in Table 8.1, it is to be expected that a disproportionately large number of poorly-educated men would be among those who had not obtained any adult education at all. The data reveal that this assumption is, by and large, correct. Not less than 118 (76%) of the 155 men who were not reached by the adult education system from 30 to 56 years of age had originally received less than eight years of formal schooling. A subgroup of those who were in this category, namely the 48 men who had dropped out of school upon reaching the age when enrolment was no longer compulsory, contained 27, who did not receive any adult education from 30 to 56 years of age. It is evident that the programs of adult education did not reach a significant proportion of those who were highly disadvantaged by having only had a short period of initial schooling.

Comparing Participants in Adult Education with Nonparticipants

Table 8.2 presents a comparison of the men who took part in adult education and those who did not, with respect to measures of father's socioeconomic status, cognitive ability at 10 and 20 years of age, level of early formal education, and occupational status at 35, 43 and 56 years of age. The approach taken was to assign all 671 men to one of four mutually exclusive categories to form a variable measuring the extent of participation in adult education. Rank scale scores ranged from 4 to 1 for the highest to the lowest categories, namely, (4) men who participated in adult education during all three time periods (N=211); (3) men who participated during two time periods (N=170); (2) men who took part during one period only (N=135); and (1) men who were not reached by the system from 30 to 56 years of age (N=155). The next step was to compute mean scores on the antecedent variables mentioned above for each of the four categories of participation indicated. Then, effect size indices were calculated to represent the magnitudes of the standardized differences of the within-group means from the overall variable mean scores. From these, the deviation scores, which measured the difference between the standardized mean scores of the highest and the lowest groups, were obtained. Table 8.2 presents the results.

The pattern indicated by the effect size indices presented in Table 8.2 is strikingly consistent with respect to both the signs and the magnitudes of the values. For the men who did not participate at all, the indices are generally large and negative. The indices generally increase in magnitude over time, so that the association between, for example, nonparticipation and occupational status is stronger at the age of 56 years than at age 35. Another example is that the deviation index of the association between measured cognitive ability at age 20 and extent of participation is positive and much larger than the one associated with participation and home background. On the whole, the size of the deviation scores strongly support the selection bias argument mentioned in Chapter One (Kiefer, 1979; Willis and Sherwin, 1979). The thrust of this argument is that studies investigating samples drawn exclusively from participant populations produce biased findings. The results support this claim because the nonparticipant group differs consistently from participant groups even with respect to other impor-

Table 8.2
Within-group relationships between antecedent variables and a measure of cumulative participation in adult education (effect sizes δ)

Antecedent Variables	Number of Periods Participated: Group 1 (never) δ_1	Group 2 (once) δ_2	Group 3 (twice) δ_3	Group 4 (thrice) δ_4	Deviation Scores $\delta_4-\delta_1$
Socioeconomic Status of the Home (SES)	−0.31	−0.21	0.13	0.25	0.56
Cognitive Ability at 10 years of age (IQ38)	−0.52	−0.07	0.02	0.33	0.85
Level of Formal Youth Education (ACLEV)	−0.62	−0.21	0.20	0.44	1.06
Cognitive Ability at 20 years of age (IQ48)	−0.62	−0.17	0.23	0.38	1.00
Occupational Status at age 35 (OCC63)	−0.60	−0.18	0.16	0.43	1.03
Occupational Status at age 43 (OCC71)	−0.67	−0.26	0.17	0.52	1.19
Occupational Status at age 56 (OCC84)	−0.71	−0.27	0.15	0.57	1.28
Number of Cases (671)	155	135	170	211	

Notes: (a) Periods refer to the time intervals over which participation in adult recurrent education is measured. Period 1 covers participation during the interval from age 30 to 35. Period 2 refers to participation from age 36 to 43. Period 3 measures participation from age 44 to 56. (b) The classification variable measures the number of periods during which the men in the sample took part in an adult education program from age 30 to 56. Group 1 did not participate during any of the three periods. Group 2 took part during one period. Group 3 participated twice. Group 4 took part during all three periods over which participation is measured.

tant variables and, thus, because the evidence shows that the exclusion of the nonparticipant group from consideration in the analysis would significantly reduce the variance of the measures investigated.

The men who participated in an adult education program during only one of the three time periods had received on average less formal education than the overall group of men followed up in the Malmö Study. These men also scored below average on the group intelligence test administered at 20 years of age. Furthermore, as is reflected in the indices of effect size (-0.18, -0.26, and -0.27), the mean occupational status of this group was also below average. Table 8.2 shows that the men who took part in adult education during two intervals in time scored above average on the antecedent variables. With respect to this group, all indices are positive, even though their values are generally smaller, as must be expected. With respect to the men who participated during all three time periods, the indices are positive and substantial.

As is the case with the other groups, the effect sizes associated with occupational status are found to increase in magnitude over time.

Table 8.3 compares the men who did not participate with those who did at some stage in their careers with regard to mean scores on ten antecedent and outcome variables of participation. Effect sizes are employed in assessing the strength of the associations investigated (Cohen, 1969). Interpretation of the results shown in Table 8.3 is straightforward. With only a few exceptions, the mean scores of the participant group are significantly higher on the antecedent and outcome variables. For example, the mean scores of the three nonparticipant groups on cognitive ability tested at age 20 are 95.2, 92.8 and 91.9, whereas the means on this variable of the men who took part in adult education are 103.3, 104.2 and 102.6. The conclusion is that participants had not only scored higher on the group intelligence test, but that selection occurred over time, so that the difference between the two groups is larger in the second time period than in the first. Relative to those who participated, the men who did not take part in adult education came from less resource-laden homes. The difference between the two groups is the largest in Period 2, that is, in mid-career (0.41). The effect sizes show that the same trend is found with regard to other antecedent variables, such as parental attitudes to their child's educational career (0.44) and teachers' ratings of student aptitude for learning (0.50). The differences are the largest with respect to the level of youth education acquired (0.73) and cognitive ability measured at 20 years of age (0.68).

Another interesting finding is obtained with respect to the attitudes to schooling of the parents of men who did not take part in adult education during the period from 30 to 35 years of age compared with the attitudes of the parents of those who participated. The association is small in early career (0.30), moderate in mid-career (0.44), and still significant in the last stage of life career (0.29). These results may provide support for the hypothesis inherent to the social capital theory proposed by Coleman (1988) that home support for schooling, as measured by the ambitions of parents regarding their child's education, not only influences school careers but also contributes, in some ways, toward shaping participation in adult education. This result indirectly supports the thesis advanced by Bourdieu and Passeron (1977) that education is one of the dimensions where participation in high status culture is strongly desired by parents. In reviewing research on the

Table 8.3

A comparison of participants in adult education (Part) with nonparticipants (Nonp) with respect to mean scores on antecedent and outcome variables (Data Set 3, N=671)

δ = effect sizes	Participation Period 1 (Age 30–35)			Participation Period 2 (Age 36–43)			Participation Period 3 (Age 44–56)		
Variable Description	Nonp $\bar{X}$	Part $\bar{X}$	Size δ	Nonp $\bar{X}$	Part $\bar{X}$	Size δ	Nonp $\bar{X}$	Part $\bar{X}$	Size δ
Socioeconomic Status of the Home	1.96	2.27	0.30	1.88	2.30	0.41	1.87	2.23	0.35
Parents' Attitude to Schooling	2.73	3.05	0.30	2.63	3.09	0.44	2.67	2.98	0.29
Intelligence Test Scores, age 10	95.91	102.08	0.39	94.32	102.55	0.52	93.09	101.68	0.54
Ratings of Students Aptitude	2.78	3.22	0.37	2.66	3.66	0.50	2.64	3.16	0.43
Level of Formal Youth Education	2.73	3.53	0.59	2.56	3.55	0.73	2.59	3.36	0.57
Intelligence Test Scores, age 20	95.17	103.33	0.49	92.81	104.17	0.68	91.90	102.56	0.64
Occupation, prior to participation	2.94	3.63	0.50	3.00	3.94	0.65	2.85	4.02	0.80
Occupation, after participation	3.13	3.94	0.56	3.03	4.13	0.75	2.77	4.10	0.87
Earnings, prior to participation	2.56	2.66	0.36	2.83	2.99	0.41	3.48	3.77	0.61
Earnings, after participation	2.86	2.99	0.34	3.53	3.79	0.55	4.43	4.75	0.70

Notes: (a) All effect sizes are significant with values greater than the 0.20 threshold level. (b) Periods refer to the time intervals over which participation is measured. (c) Due to missing data compensation, some estimates differ slightly from those recorded in Tuijnman and Fagerlind (1989, p. 59).

effects of home background on educational career, Alwin and Thornton (1984, p. 785) note that family influences on educational careers are most often assessed using samples of adolescent students. The effects of family factors on education over a long time period are not often investigated. Since the associations between parental attitudes to the formal schooling of their offspring and participation in adult education one and two decades later are significant, the question arises as to whether and to what extent the attitudinal dimension of the home exerts a lasting effect on an individual's life career, for example, by influencing participation in adult education after the influences of early formal education have been taken into account. This issue is taken up later in this monograph.

With regard to occupational status both prior and subsequent to either participation or nonparticipation in adult education, the results presented in Table 8.3 indicate not only that the mean scores of the participant groups increase with time, but also that the differences are greater after participation than before. The fact that the associations between participation variables and measures of occupational status become stronger over time is probably partly a result of the expansion of in-service training in Sweden since the 1970s (see Chapter Three). That the association between participation and occupational status is consistently higher subsequent to participation seems to indicate that participation has a positive influence on occupational attainment.

The findings with respect to earnings are similar to those for occupational status measured in mid-and late career, even though the opposite trend is found in early career (0.36 and 0.34). The weak relationship between adult education and earnings early in the individual life career is consistent with studies reviewed in Chapter Four. The weakness of this association is generally explained as a result of the powerful effects of schooling (Mincer, 1974). The small negative difference in mean earnings is also consistent with the results of some previous studies in this area (Fraker and Maynard, 1987; Ziderman, 1987). Although this interpretation could not be tested empirically due to a lack of historical and longitudinal data on the costs of adult recurrent education, the explanation generally offered in treatises on the economics of education (Becker, 1964; Stoikov, 1975) is that a part of the money used to finance further education during this early stage in the individual life career is contributed by participants both directly and in the form of earnings foregone (Blaug, 1976).

Another finding of some importance is that the associations between home background and parental attitudes to schooling, on the one hand, and participation in adult education on the other are stronger in mid-career than in early career. In so far as the men included in the Malmö Study are concerned, this finding could be interpreted as suggesting that the widening of educational opportunities during the period from 1964 to 1971 benefited those who came from richer homes more than those with an initially low socioeconomic background. Ironically, the widening of educational opportunities for adults in the 1960s, which in part was motivated by the desire to even out differences in educational opportunities and attainment, has thus probably strengthened the degree of social bias in recruitment to adult education, since those of higher status backgrounds more frequently took advantage. However, it should also be noted that the associations between both home background and youth educational attainment, and participation, become weaker during the period from 1971 to 1984. It is possible that these changes are a result of cohort maturation. Yet they may also indicate that status factors were generally less important in the recruitment process during this period.

Because the associations between cognitive ability and participation remain fairly stable over time, it appears that the role of meritocratic factors relative to home background factors became stronger during the 1970s and early 1980s. If confirmed by analysis using more stringent statistical methods, these findings support the idea that, relative to the pattern observed in the 1960s, the distribution of participation in adult education has become more equitable during the 1970s and early 1980s. This speculation notwithstanding, the association between youth education and participation is substantial even during the late stage in life career. Accordingly, the evidence so far generated by using data derived from the Malmö Study does not support the argument that adult education has served to level out group differences in educational opportunities and attainments. However, the question which remains to be answered is whether the social bias in recruitment to adult education during the 1980s would have been even worse without the expansion of adult education during the 1970s.

The indices of effect size included in Table 8.2 and Table 8.3 denote only general differences between the comparison groups. Hence, the results and the discussion of them must be regarded as tentative and exploratory. This limitation arises because no causal inferences can be

made from indices of effect size. The purpose of the analysis carried out in the next part of the current chapter is to investigate the relationships rather than associations between the variables studied above. That is, the aim is one of discerning whether causal networks of influence are involved.

Stability of Participation in Adult Education: Hypotheses

Adult education theory generally suggests that the likelihood of participation in educational programs in adult life is not only positively enhanced by youth educational attainment but also by early experiences of adult education (Rubenson, 1987b). Hence, a question of substantive theoretical and practical interest in the field is that of the relative importance of both youth education and early participation in predicting subsequent participation in adult education. A causal structure can be hypothesized between these variables. Figure 8.2 shows a hypothesized path model of the recurrent education cycle.

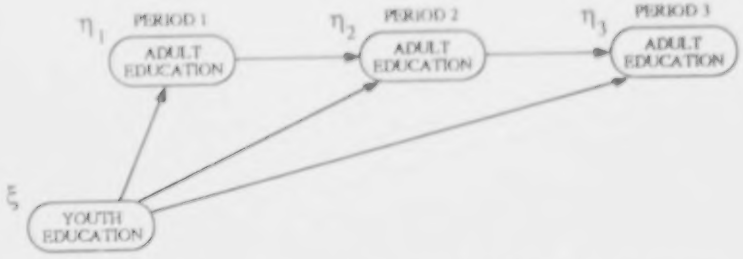

Figure 8.2. A path diagram showing the hypothesized model of the recurrent education cycle.

The path model of the recurrent education cycle was developed for the dual purposes of studying the predictive capacity of youth educational attainment and the stability of recurrent participation in adult education over time. It can be seen from Figure 8.2 that the model is recursive, with both a temporal and a conceptual sequence determining the ordering of the variables. A pathway of influence is hypothesized as follows.

Hypothesis One. Youth educational attainment has a significant direct effect on every one of the three constructs measuring participation in adult education (H1).

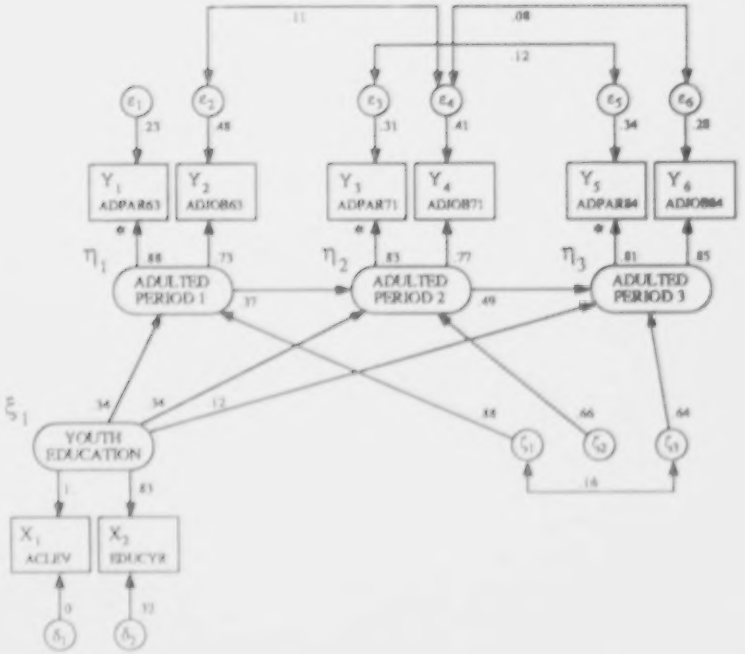

Figure 8.1. Parameter estimates in a model of the recurrent education cycle.
Notes: (a) All parameters except δ_1 are significant at the five per cent level (t-values greater than two). Table A8.11. (b) Maximum likelihood, standardized solution. (c) The goodness of fit of the model to the data is adequate (χ^2 is 16.1 with 11 degrees of freedom and probability 0.14).
Where ξ_1 indicates youth educational attainment (YE);
η_1 indicates adult education received during Period 1 (AE1);
η_2 indicates adult education received during Period 2 (AE2);
η_3 indicates adult education received during Period 3 (AE3);
X_1 denotes level of formal youth education acquired;
X_2 denotes years of formal education received;
Y_1 denotes participation (all forms) from age 30 to 35;
Y_2 denotes job-related adult education from age 30 to 35;
Y_3 denotes participation (all forms) from age 36 to 43;
Y_4 denotes job-related adult education from age 36 to 43;
Y_5 denotes participation (all forms) from age 44 to 56;
Y_6 denotes job-related adult education from age 44 to 56.

Hypothesis Two. Early participation in adult education has both a direct and a cumulative effect on participation during a subsequent period (H2).

Hypothesis Three. The effects of youth educational attainment decrease in strength over time, so that youth education most strongly predicts participation in adult education from 30 to 35 years of age, and least strongly participation from 44 to 56 years of age (H3).

Hypothesis Four. The effects of early participation on later participation become stronger over time (H4).

Stability of Participation in Adult Education: Findings

Figure 8.3 presents standardized path coefficients estimated in the LISREL model of the recurrent education cycle. The model is fitted to data from the sample in Data Set 3, using product moment correlations and the maximum likelihood approach. As was mentioned in Chapter Seven, an analytical problem is encountered in defining and operationalizing youth education (ξ_1). Two measures are used, namely, (1) number of years of schooling received and (2) level of formal education acquired. Even though the scale of the latent variable is not determined beforehand by assigning a fixed non-zero value to the measurement parameter of one of the observed variables, it is found that the measurement error associated with acquired level of formal education (δ_1) is not significant at the five per cent level. Because the LISREL computer program estimates the error in this measure to be insignificant, the variable years of schooling received can be considered to be redundant in the analysis.

The estimates included in the path diagram indicate that the path coefficients obtained for the effects of youth education (δ_1) on the three constructs measuring participation in adult education (n_1, n_2 and n_3) are 0.34, 0.34 and 0.12, respectively. The standard errors associated with these coefficients are small and invariant over time (0.04). Because youth educational attainment has a significant effect on all three participation variables, the first hypothesis (*H1*) must be considered supported by the data. Youth educational attainment explains 12 per cent of the variance in the construct measuring participation in adult education from 30 to 35 years of age (Period 1). The second hypothesis (*H2*)

is also confirmed, since the results clearly show that the predictive capacity of early participation on subsequent participation increases over time (0.37 and 0.49). The variance explained in the construct measuring participation in adult education during the third period, 36 per cent, is mostly accounted for by early participation. Figure 8.3 shows that the residuals of the first and the third participation variables are correlated. This finding supports that part of the second hypothesis (*H2*) which claims that participation from age 30 to 35 (Period 1) influences participation from age 44 to 56 (Period 3), since the indirect effect of participation during Period 1 on participation during Period 3 is clearly significant (0.18). As a consequence, the results not only confirm the fourth hypothesis (*H4*) mentioned earlier, but also provide strong support for the argument that participation in adult education should not be regarded as incidental but rather as cumulative over time.

Because the direct influence of youth education decreases in strength from Period 2 to Period 3 but not from Period 1 to Period 2, as is hypothesized, the findings with respect to the third hypothesis (*H3*) are difficult to interpret. It can be calculated from Figure 8.3 that the coefficients associated with the total effects of youth education on participation in adult education over time are 0.30, 0.39 and 0.28, respectively. Thus the effect of youth education on participation in adult education is not the strongest during the first period. Instead, the influence of youth education increases somewhat from early to mid-career, and decreases only thereafter. In conclusion, whereas the influence of youth education on occupational status is found to decrease in strength after 30 years of age (Mincer, 1974), this result is not replicated with respect to the influence of youth education on participation in adult recurrent education.

The findings so far obtained can be interpreted as indicating that the system of adult education has served to reinforce the gaps in educational attainment between Malmö Study groups. The widening of opportunities for participation in programs of adult education does not seem to constitute an effective approach to equalizing educational attainment, since those who originally received a better education are consistently overrepresented in adult education. While this finding is not surprising because it replicates those of other studies reviewed in Rubenson (1987b) and Tuijnman (1989b), the analysis has arrived at additional insights. First, the influence of schooling on participation in adult education during the last stage of life career is largely mediated by early

participation in the Malmo Study group. Second, not only does youth education constitute a factor differentiating between those who are likely to participate in adult education early in the life career and those who are not, but also a factor contributing to participation in a lifelong perspective.

It should be mentioned that the effects of both early formal education and early participation on subsequent participation in adult education are not as high as the coefficients often found in two-wave or simplex models in which the same variables are measured repeatedly for the same individuals on several different occasions with the purpose of estimating the stability of influences over time. For example, Jöreskog and Sörbom (1988, Chapter VI, p. 42) found a path coefficient as large as 0.98 for the regression of a construct measuring the verbal ability of a nationwide sample of students in the ninth grade of schools in the United States on the verbal ability of the same students assessed in the seventh grade. Another example of a stability coefficient is presented in Chapter Nine of the current monograph. Here, a path coefficient with a value of 0.71 is obtained in the regression of cognitive ability at age 20 on cognitive ability at age 10. By comparison, the path coefficients indicating the stability of participation in adult education over time (see Figure 8.3) are only moderate in size. The important implication is that there must be possibilities for intervention in the case of adult education, since a large proportion of the variance in the participation variables is not explained by antecedent factors which generally measure similar aspects of the educational experience. Hence, it follows that the recurrent education cycle cannot be comprehended without the inclusion and analysis of other variables influencing participation. Finally, because there is evidence in support of the view that the effects of educational experiences in a recurrent cycle are cumulative, an attempt must be made to recruit as many people into adult recurrent education at as early an age as possible.

Predicting Participation in Adult Education: Propositions

A diagram of a hypothesized path model predicting participation in adult recurrent education is presented in Chapter Four (Figure 4.2). It should be recalled that more than prediction is involved, since the theoretical model consists of two parts. The first includes the antecedents of youth education and the second antecedents of participation in adult education. The network of relationships involved in the first part of the model was estimated in the preceding chapter. The hypotheses undergirding the ordering of these variables are not considered here (but see Tuijnman and Fägerlind, 1989). The second component comprises four variables hypothesized to mediate and reinforce the effect of early formal education on subsequent participation in adult recurrent education, namely, occupational status, earnings, job satisfaction, and interest in adult education.

As was described in Chapter Four, the resource conversion theory (Fägerlind, 1975) argues that antecedent factors measured in childhood influence life career outcomes and participation in adult education only indirectly, as mediated by youth educational attainment. Hence, the first, central proposition (*P1*) is that the four antecedents of youth educational attainment shown in Figure 4.2 influence the variables in the second part of the path model only indirectly. The second proposition (*P2*) is that youth educational attainment exerts direct effects on both occupational status and earnings. Proposition Three (*P3*), a causal pathway of influence is hypothesized to exist between youth education, occupational status and earnings, through job satisfaction, to interest in adult education. The conceptual sequence determining the ordering of these variables is based on two expectations: (1) workers employed in low status occupations with below average pay are less satisfied with their jobs than those in high status occupations, and (2) the relatively well-educated men in the Malmö Study are, on average, more interested in adult education than those who have only had a short level of initial formal education. Proposition Four (*P4*), it is considered that those who are dissatisfied with their present job are more interested in adult education than those who are satisfied. Proposition Five (*P5*), youth educational attainment, occupational status and expressed interest in adult education influence positively actual participation.

Predicting Participation in Adult Education: Findings

The following strategy was used in the estimation of two path models predicting participation in adult education from 36 to 43 years of age (Period 2) and participation from 44 to 56 years of age (Period 3). Because multiple measures of the theoretical variables were not available in all cases, causal models for directly observed variables rather than full LISREL models were estimated. A stepwise procedure was employed in the fitting of the two models to the sample covered in the third data set. The fully recursive and just-identified model was first estimated, by using the maximum likelihood fit function. The five per cent level of statistical significance was used as a threshold to guide the decision about which paths were not significantly different from zero. These trivial relationships were deleted from the model in the second stage, in which all retained paths were reestimated in over-identified path models. Asterisks are used in the tables to indicate the parameters which were dropped in the second stage. The standard errors associated with these parameters are shown in parentheses.

Table 8.4 shows the coefficients obtained in the prediction of participation in adult education during Period 2 (from 36 to 43 years of age). The ordering of the variables should be noted. The antecedents comprising the second part of the model, i.e. occupational status (variable 6), earnings (7), job satisfaction (8) and interest in adult education (9) are measured by using responses to the questionnaire delivered in 1963. Because the dependent variable (10) is based on information taken from the questionnaire data collected in 1971, the ordering of the variables follows both a conceptual and a temporal sequence. No data on job satisfaction and interest in adult education were collected in the Malmö Study prior to age 35. Accordingly, it was not possible to develop a conceptually identical model that could be employed in the prediction of participation in adult education during Period 1 (from age 30 to 35). This explains why two rather than three models are estimated in the current chapter. In conclusion, the antecedent variables (6, 7, 8, and 9) included in the model shown in Table 8.4 predict participation from 36 to 43 years of age. These antecedents are based on data collected in 1963 (age 35). However, the corresponding variables in the model included in Table 8.5 predict participation during Period 3, that is, from 44 to 56 years of age. In this case, the antecedents involve data collected in 1971 (age 43).

Table 8.4

Parameter estimates in a LISREL model predicting participation in adult education from 36 to 43 years of age

Dependent Variables	Independent Variables									R^2
	1	2	3	4	5	6	7	8	9	
1 Socioeconomic Status of the Home (SES38)	n.a.									n.a.
2 Cognitive Ability at Age 10 (IQ38)	0.29 (0.04)									0.08 (0.04)
3 Parents' Attitude to Schooling (PEDATT)	0.33 (0.04)	0.15 (0.04)								0.16 (0.05)
4 Teachers' Ratings of Student Aptitude (TERQ)	0.06 (0.03)	0.62 (0.03)	0.12 (0.03)							0.47 (0.03)
5 Level of Formal Youth Education (ACLEV)	0.31 (0.03)	0.28 (0.04)	0.17 (0.03)	0.20 (0.04)						0.49 (0.03)
6 Occupational Status at Age 35 (OCC63)	0.08 (0.03)	0.09 (0.03)	−0.00* (0.03)	0.02* (0.04)	0.59 (0.04)					0.48 (0.03)
7 Earnings at Age 35 (LINC63)	0.07 (0.03)	0.07 (0.03)	−0.02* (0.03)	−0.04* (0.04)	0.17 (0.04)	0.51 (0.04)				0.51 (0.03)
8 Job Satisfaction at Age 35 (JEEL63)	−0.07* (0.04)	0.07* (0.05)	0.05* (0.04)	−0.09* (0.05)	0.13 (0.05)	0.28 (0.06)	0.18 (0.05)			0.12 (0.05)
9 Interest Adult Education at Age 35 (INTER63)	0.04* (0.05)	0.09* (0.05)	−0.02* (0.04)	−0.04* (0.05)	0.07* (0.06)	0.09* (0.06)	−0.00* (0.06)	0.12 (0.04)		0.02 (0.05)
10 Participation in Adult Education, Age 36 to 43 (ADPAR71, Period 2)	0.01* (0.04)	0.05* (0.05)	0.05* (0.04)	0.04* (0.05)	0.27 (0.05)	0.15 (0.05)	−0.09* (0.05)	0.05* (0.04)	0.08 (0.04)	0.16 (0.05)

Notes: (a) The goodness of fit of the model is adequate (χ^2 is 26.7 with 21 degrees of freedom and probability 0.18). (b) Standard errors in parentheses. (c) Maximum likelihood, standardized solution. (d) Paths marked with an asterisk are not significant. Stepwise regression was used for the removal of these trivial paths prior to the estimation of the final model. (e) Coefficients of determination (R^2) show the amount (per cent) of variance explained by the independent variables in the dependent variables.

The estimates shown in the column on the right hand side in Table 8.4 indicate that the four antecedent variables (1, 2, 3 and 4) of youth educational attainment (5) collectively explain 49 per cent of the variance in this dependent variable. Because a slightly higher estimate was produced in the latent-variable model shown in Figure 7.2, the use of directly observed variables reduces the capacity of the model to estimate the relationships involved. If the results are compared with those in Figure 7.2, then it can be seen that the exclusion of measurement errors from consideration inflates the path coefficient associated with the effect of cognitive ability (2) on youth educational attainment (5) from 0.24 to 0.28, and reduces the coefficient for the influence of home background (1) from 0.39 to 0.31. It follows that the parameters esti-

mated in the models shown in Table 8.4 and Table 8.5 should be regarded with some reservation, especially since these do not take measure-ment errors into account. However, the goodness of fit of both models to the data is adequate, because the estimated probabilities of deviation associated with the models are in excess of the 10 per cent level of significance which is commonly used in evaluating the goodness of fit of linear structural equation models.

The estimates presented in Table 8.4 indicate that the model predicting participation in adult education during Period 2 (age 36 to 43) explains 48 per cent of the variance in occupational status (6) and 51 per cent in earnings (7) at age 35. An unexpected result is that significant paths are found from home background (1) and cognitive ability measured at age 10 (2) to occupational status and earnings. However, it can be calculated from the parameter estimates that the indirect effects of home background and cognitive ability on occupational status and earnings, which are mediated by formal youth education, exceed in magnitude the values of the standardized path coefficients. This finding is in line with the resource conversion theory (Fägerlind, 1975). Nevertheless, the first proposition (*P1*), according to which variables specified in the first part of the model should not directly influence the variables in the second part, must be rejected.

Youth educational attainment (5) exerts significant effects on occupational status (0.59) and earnings (0.17) at age 35. Accordingly, the second proposition (*P2*) is confirmed. The results are less self-explanatory with regard to the third proposition (*P3*), which argued for a pathway of influence between occupational status (6), earnings (7), job satisfaction (8) and interest in adult education (9). The following cumulation of effects is found. Youth educational attainment has a weak negative effect on job satisfaction (-0.13). Occupational status and earnings have significant effects on job satisfaction (0.28 and 0.18). Job satisfaction is found to have a weak negative effect on interest in adult education (-0.12). It follows from the above that, although a pathway of influence is discovered, it operates differently from the one considered in the third proposition (*P3*), particularly with respect to the role of youth educational attainment (5). The findings indicate that youth educational attainment and interest in adult education (9) are not causally related, because the coefficient estimated for this path is not significantly different from zero (-0.07). Consequently, the third proposition (*P3*) is partly supported and partly rejected. Furthermore, the

Table 8.5

Parameter estimates in a LISREL model predicting participation in adult education from 44 to 56 years of age

Dependent Variables	Independent Variables									R^2
	1	2	3	4	5	6	7	8	9	
1 Socioeconomic Status of the Home (SES38)	n.a.									n.a.
2 Cognitive Ability at Age 10 (IQ38)	0.29 (0.04)									0.08 (0.04)
3 Parents' Attitude to Schooling (PEDATT)	0.33 (0.04)	0.15 (0.04)								0.16 (0.05)
4 Teachers' Ratings of Students Aptitude (TEIQ)	0.06 (0.03)	0.62 (0.03)	0.12 (0.03)							0.47 (0.03)
5 Level of Formal Youth Education (ACLEV)	0.31 (0.03)	0.28 (0.04)	0.17 (0.03)	0.20 (0.04)						0.49 (0.03)
6 Occupational Status at Age 43 (OCC71)	0.13 (0.03)	0.05* (0.03)	0.03* (0.03)	−0.06* (0.04)	0.60 (0.03)					0.45 (0.03)
7 Earnings at Age 43 (LINC71)	0.03* (0.03)	0.04* (0.03)	−0.02* (0.03)	−0.03* (0.04)	0.23 (0.03)	0.38 (0.03)				0.56 (0.02)
8 Job Satisfaction at Age 43 (JFEL71)	−0.03* (0.04)	0.05* (0.05)	0.06* (0.04)	−0.05* (0.05)	−0.08* (0.05)	0.18 (0.06)	−0.08* (0.06)			0.03 (0.05)
9 Interest Adult Education at Age 43 (INTER71)	−0.02* (0.05)	0.07* (0.05)	−0.00* (0.04)	−0.07* (0.05)	0.01* (0.06)	0.18 (0.04)	−0.08* (0.06)	0.03* (0.04)		0.03 (0.05)
10 Participation in Adult Education, Age 44 to 56 (ADPAR84, Period 3)	−0.01* (0.04)	0.12 (0.04)	−0.01* (0.04)	0.04* (0.05)	−0.04* (0.05)	0.31 (0.04)	0.04* (0.05)	0.02* (0.04)	0.19 (0.04)	0.19 (0.04)

Notes: (a) The goodness of fit of the model is adequate (χ^2 is 26.9 with 26 degrees of freedom and probability 0.42). (b) Standard errors in parentheses. Rounding errors have occurred. (c) Maximum likelihood, standardized solution. (d) Paths marked with an asterisk are not significant. Stepwise regression was used for the removal of these trivial paths prior to the estimation of the final model. (e) Coefficients of determination (R^2) show the amount (per cent) of variance explained by the independent variables in the dependent variables.

fourth proposition (*P4*), which asserted that those who are dissatisfied with their present job are more interested in adult education than those who are satisfied, is supported, since job satisfaction (8) is found to influence negatively (-0.12) interest in adult education (9), as was hypothesized.

Three significant paths are found with respect to the prediction of participation in adult education (10), namely, those associated with youth education (5), occupational status (6) and interest in adult education (9). It follows that the fifth and last proposition (*P5*) is also confirmed, even though it should be noted that the values of the path coefficients are generally low. This is particularly true of the effect of expressed interest in adult education on participation during a sub-

sequent time period (0.08). Hence, the implication is that interest in adult education does not seem to be an important determinant of actual participation. It is interesting to note that the effect of youth educational attainment on participation (0.27) is nearly twice as large as the effect (0.15) of occupational status. However, the influence of occupational status contains a partial effect of youth education, so that the effect on participation of youth educational attainment outweighs those of the other factors investigated in the model. Caution in interpretation is called for, however, because 16 per cent of the variance in participation in adult education is explained in the model.

Table 8.5 reports maximum likelihood estimates of parameters in the model predicting participation in adult education from age 44 to 56 (Period 3, 1972–1984). Some differences emerge when this model is compared with the one reported in Table 8.4. For example, only one significant relationship is found between the variables comprising the first component of the model and the two measures of life career outcomes in the second, namely, the effect (0.13) of home background (1) on occupational status (6) at 43 years of age. Contrary to the results obtained in the model predicting participation in Period 2 (Table 8.4), the effects of youth education on both job satisfaction (-0.05) and participation in adult education (-0.04) are not significant. Because the influence of earnings (7) on job satisfaction (8) is also trivial (0.08), only one variable has a significant effect on job satisfaction, namely, occupational status (0.18). That the effect of youth education on participation in adult education during Period 3 from 44 to 56 years of age is not significant (-0.04) would seem to contradict Figure 8.2, in which a significant path coefficient was estimated (0.12). However, it should be recalled that the recurrent education cycle could not be adequately comprehended without taking into consideration other variables influencing participation. The path coefficients recorded in Table 8.5 clearly demonstrate that the effect of youth educational attainment on participation in adult recurrent education is mediated by the effect (0.31) of occupational status.

Another difference from the model shown in Table 8.4 is that job satisfaction (8) does not significantly influence interest in adult education (9). Thus, perhaps as a consequence of maturation and diminishing career ambitions in the late stage of life career, those who were not satisfied with their job at age 43 were not exceptionally interested in adult education. Instead, occupational status (6) is found to influence

interest in adult education (0.18). As in the first model, the effect of youth educational attainment (5) on interest in adult education (9) is not significant in the second path model either. With respect to the prediction of participation in adult education (10), cognitive ability in childhood (2) has a significant effect (0.12). Occupational status (6) and interest in adult education (9) are also found to influence participation in adult education from 44 to 56 years of age (0.31 and 0.19). Compared with the first model, these effects on participation in adult education are greater in magnitude. However, the three significant paths explain not more than 19 per cent of the variance in the participation variable (Period 3), compared with 16 per cent accounted for in the path model predicting participation in adult education during mid-career (Period 2). Finally, with respect to the hypothesis formulated rather early in this chapter, namely, that parental attitudes to education exert a lasting influence on life career, as mediated by adult education, the findings are only partly supportive. Even though the indirect effect of parental attitudes on occupational status is significant both at age 35 (0.17 x 0.60 = 0.10) and at 43 years of age (0.10), adult education does not appear to mediate this relationship.

Summary and Discussion of Findings

At a general level, the study has found evidence of significant differences between the men who took part in adult education and those who were not reached by the system. These differences are particularly large with regard to home background, early formal education, cognitive ability and occupational status. Because the mean scores on the control variables of the group consisting of nonparticipants is found to deviate remarkably from those of the other groups involved in the analysis, the findings strongly support the claim that studies investigating samples which are representative only of participant populations produce inadequate and biased results. Furthermore, because the mediated influence of youth educational attainment on subsequent participation in adult education is generally significant and positive, it is probable that adult education widens rather than diminishes the gaps in educational opportunity and attainment between social groups.

As estimated by using effect sizes (Cohen, 1969), the probability that the mean score on youth education of a randomly chosen participant in

adult education exceeds the score of a randomly chosen nonparticipant is approximately 64 per cent. It should be emphasized in this connection that this estimate is obtained by comparing the *means* of two groups in the Malmö Study, namely, participants and nonparticipants. Even though a perpetuity relationship with a probability of 64 per cent must be considered to be significant, it is not so high as to preclude capacity for social intervention in the field of adult education. This interpretation is supported by the finding that the inclusion in path models of variables such as home background, cognitive ability, youth education, occupational status, earnings, job satisfaction and interest in adult education, collectively, explain not more than between 16 and 19 per cent of the variance in the participation variables.

However, there is some indication that the situation is more complicated than suggested above. For example, it is found that the mean intelligence test scores of the participant groups consistently exceed those of the nonparticipants. Throughout the periods over which participation in adult education is measured, i.e. from 30 to 56 years of age, the differences between the mean scores of the comparison groups on the intelligence tests and the population mean score are about one-third of a standard deviation. The importance of cognitive factors in influencing recruitment is underscored by the finding that the effect of cognitive ability (0.12) measured at 10 years of age on participation in adult education during the period from 44 to 56 years of age is positive and significant. This result appears to suggest that common generalizations of the kind "those who obtain more early formal education will also receive the most adult education" are, while not entirely inaccurate, at least misleading, since cognitive factors are also implicated in this relationship. Because the antecedent variables explained between 16 and 19 per cent of the variance in the participation variables, there are other factors influencing the decision to take part in programs of adult education, that have not been investigated in the path models investigated in the current chapter.

The results strongly support the argument frequently made in expositions involving recurrent, lifelong or continuing education (OECD, 1973; Lowe, 1982; Rivera, 1983; Coombs, 1985; OECD, 1988) that participation in adult education is not coincidental and unique, but a systematic, recurrent and cumulative phenomenon. While not surprising, this result nevertheless has an important implication for educational policy. As was noted in Chapter Two, the original concept of recur-

rent education proposed in the late 1960s not only emphasized the interdependence of economic, labour market, social and educational policies, but also implied the planned redistribution of opportunities and participation in educational programs across the life span of individuals in alternation with work and leisure. Central to the original idea of recurrent education was the postponement of a component of upper secondary or tertiary education until a mature age, so that educational careers would be motivated by actual experiences of work, realistic self-assessments, and concrete occupational choices. The results arrived at in this chapter give empirical support for the criticism of recurrent education as formulated by Blaug and Mace (1977), who questioned the value of a policy of postponement.

The evidence suggests that higher levels of early educational attainment increase the probability that a person participates in further education. Postponement of a component of early formal education is likely to have a negative influence on the transition rate of students to full time degree studies in higher education. As a strategy for containing demand for higher education and supplying the labour market with the required middle-level personnel, a policy of postponement may have certain advantages for society. However, the analyses so far undertaken in this investigation call the benefits of postponement into doubt at the individual level. The findings indicate that a recurrent cycle of accumulation is in operation, so that the quality of earlier experiences of education predict the quality and amount of experiences subsequently gathered. It follows that, relative to individuals who transfer immediately from school to higher education, those who postpone some part of their formal education until a more mature age are likely to be disadvantaged in the long term perspective.

The current chapter has mainly focussed on the equity dimension of recurrent education. However, it was mentioned in Chapter Two that another goal of recurrent education relates to economic growth and stabilization. In Sweden, education and training policies have been part and parcel of the so-called Swedish model, which has evolved since the 1940s. This model, which is also known as the Rehn-Meidner model, is aimed at creating the conditions necessary for achieving full employment while minimizing the expected negative influences of such conditions on consumer price inflation and economic stability (Wadensjö *et al.*, 1988). Labour market policy is regarded as an important element in the model. An active labour market policy presents a mix of instru-

ments that can selectively be used to influence the supply and demand for manpower and educational services. While labour market training, mobility grants and counter-cyclical mechanisms such as information systems, labour exchanges and advisory services are among the conventional policy instruments of active labour market policy, adult recurrent education and in-service training in internal labour markets are, more recently, being recognized as constituting further elements of importance to the functioning of the Rehn-Meidner model (Standing, 1988; Dahlberg, 1989; Tuijnman, 1989b).

The issue of the further education and training of the labour force can be interpreted not only as constituting a pivot for recurrent education policy, as was argued in Chapter Three, but also as the link connecting the idea of recurrent education with the policy dimensions implicated in the Swedish model. Thus, since recurrent education constitutes a partial strategy within this social democratic or Swedish model, it is also aimed at contributing to the goals of achieving full employment while suppressing inflation, and promoting economic stabilization and growth. Among other means, policies of recurrent education seek to achieve these goals by influencing the capacity, flexibility and efficiency of the labour force in responding to the demands of the production system. In Chapter One it was mentioned that, despite the widely-adhered to belief that adult recurrent education has significant effects on the efficiency of producing goods and services and, more indirectly, on economic growth, estimates of the nature and magnitude of these linkages are generally not available.

Consistent with the third aim of the investigation mentioned in Chapter One, the purpose of the next chapter is to find out whether measures of the cumulative experience of adult education obtained by the men surveyed in the longitudinal Malmö Study have significantly influenced their occupational attainments and have provided benefits in the form of augmented earnings.

Chapter 9
The Occupational and Economic Benefits of Recurrent Education in a Life Span Perspective

The review of previous research presented in Chapter Four demonstrated that many studies have investigated the process of status attainment in general, and the role of education in promoting life chances in particular. The point of departure for the several analyses of data carried out in this chapter is the argument that the influences of youth education on life career outcomes, such as occupational status and earned income, should be separated from the possible effects of adult recurrent education. The chief purpose is to estimate the differential effects of youth education and adult recurrent education, respectively, in the status attainment process spanning the period from 25 to 56 years of age. Of central interest is the question as to whether adult recurrent education has had a discernible effect on the life chances of the *men* surveyed in the Malmö Study. As has been pointed out in Chapter One, the exclusion from consideration in path models of the important antecedent variables of both youth educational attainment and adult recurrent education can bias the estimates obtained in the regression of life career outcomes on measures of educational attainment. As a consequence, the effects of home background and cognitive ability are also examined.

Central Hypotheses and Time-related Propositions

A path diagram for a hypothesized model of status attainment was presented in Figure 4.3 in Chapter Four. This path diagram illustrates the hypotheses tested in the combined model of status attainment and structural maintenance. The following hypotheses are central to the ordering of the variables in this model.

Hypothesis One. Home background has a moderate effect on cognitive ability measured in childhood and a strong effect on youth educational attainment.

Hypothesis Two. Home background influences indirectly rather than directly cognitive ability measured at 20 years of age as well as adult recurrent education, occupational status and earned income. Even though the effects of home background on outcome variables are expected to be mediated by other variables in the model, it is hypothesized that the total or aggregate effect of home background on occupational status and earned income is strong throughout the stages of the adult life span investigated, i.e. from 25 to 56 years of age.

Hypothesis Three. Cognitive ability measured in childhood has a significant effect on youth educational attainment.

Hypothesis Four. Cognitive ability in childhood and youth education influence, collectively, cognitive ability in early adulthood.

Hypothesis Five. Youth educational attainment and cognitive ability in adulthood influence participation in adult recurrent education.

Hypothesis Six. Youth educational attainment, cognitive ability in adulthood and adult recurrent education influence significantly occupational status.

Hypothesis Seven. Youth educational attainment, adult recurrent education and occupational status influence earned income.

As has been pointed out in the previous chapter, participation in adult recurrent education can be considered to be an intermediate outcome of a complex interaction occurring among factors such as initial educational attainment, cognitive ability in adulthood and job satisfaction. In accordance with the resource conversion theory outlined in Chapter Four, adult recurrent education is expected to advance continuously the processes whereby various personality characteristics and marketable assets which have been acquired through the years of formal schooling influence life career outcomes (Tuijnman and Fägerlind, 1989). It follows that the explanatory capacity of the antecedent variables is expected to change as a function of age. The resource conversion theory provides three time-related sets of propositions for the analyses of data undertaken in the current chapter.

Proposition Area One. With respect to the effects of youth educational attainment and cognitive ability in adulthood on occupational attainments over the adult life span, the following is hypothesized (see also

Tuijnman, 1986, and Tuijnman *et al.*, 1988). Youth educational attainment has strong effects on occupational attainment during the early period of life career, measured at 25, 30 and 35 years of age. In accordance with previous research on the enduring effects of education, e.g. Featherman and Hauser (1978), it is postulated that the effect of youth educational attainment on occupational status is the strongest around age 30. It is also argued that this effect decreases in strength with advancing age, even though it is expected to be significant in the late stage of life career, measured in this investigation at 52 and 56 years of age. Contrary to this, it is expected that the effects of cognitive ability on occupational attainments are reasonably stable over time. Hence, it follows from the above that it is considered that the influence of youth educational attainment on occupational attainment is increasingly mediated by cognitive ability and adult education with increasing age.

Proposition Area Two. With regard to the influences of youth education and cognitive ability on earned income over time, the following is anticipated. It is hypothesized that youth education exerts significant effects on earned income in the early and middle stages of the individual life career (i.e. at 25, 30, 35, 40 and 43 years of age), but not on earned income in the late stage of life career, assessed at 52 and 56 years of age. That is, consistent with results obtained in studies investigating the age-earnings profiles of men in the United States (see Chapter Four), it is argued that the influence of youth educational attainment on earned income at 25 years of age is, although weak, statistically significant. After age 25, this influence is expected to augment drastically until, by 40 years of age, a peak is reached. However, it is postulated that the direct influence of youth educational attainment on earned income diminishes rapidly subsequent to this age until, late in the life careers of individuals, this influence becomes statistically insignificant. Moreover, it is considered that cognitive ability in adulthood exerts significant effects on occupational attainments from the early to the late stage of life career. It is also argued that cognitive ability in adulthood exerts either insignificant or weak direct effects on earned income. Thus, it is postulated that the influence of cognitive ability in adulthood on earned income is for the most part an indirect effect, mediated by occupational attainments.

Proposition Area Three. With regard to the anticipated effects on life career outcomes of adult recurrent education received from 25 to 56 years of age, the following hypotheses are advanced to guide the analysis of the data. The effects of adult recurrent education on occupational attainments are expected to be significant throughout the stages of life career investigated, i.e. at 35, 40, 43, 52 and 56 years of age. Moreover, it is hypothesized that the effects of adult recurrent education on occupational status augment from the early to the late stage of life career. Thus, it is argued that the effects are weak at 35 years of age and strong at 52 and 56 years of age.

Moreover, it is postulated that the paths from adult recurrent education to earned income assessed in the early and mid-career stages of life at 35, 40 and 43 years of age are not statistically significant, since these effects are considered to be mediated by occupational attainments. However, since it is hypothesized that the effects of youth educational attainment on lifetime earnings diminish subsequent to 40 years of age, the influences of adult recurrent education on earnings are anticipated to increase relative to the decreasing effects of youth educational attainment. Furthermore, because it is argued that the influences of adult recurrent education become stronger over time, it can be hypothesized that the effects of adult recurrent education on earned income at 52 and 56 years of age are not fully mediated by occupational status and, thus, that the effects of adult recurrent education on earned income are considered to be weak but significant in the late stage of the life careers of individual men.

The LISREL Measurement Model

Figure 9.1 presents a path diagram of the hypothesized status attainment model. It not only indicates the theoretical variables and the relationships described in the conceptual model presented in Chapter Four, but also shows the measurement model employed in the estimation of structural parameters. It can be seen from the diagram that only four of the seven theoretical variables can be estimated using more than one observed variable. It will be recalled that no data were collected in the Malmo Study regarding participation in adult recurrent education prior to 30 years of age. The first period during which adult education is measured extends from 30 to 35 years of age (Period 1). Hence, it is not

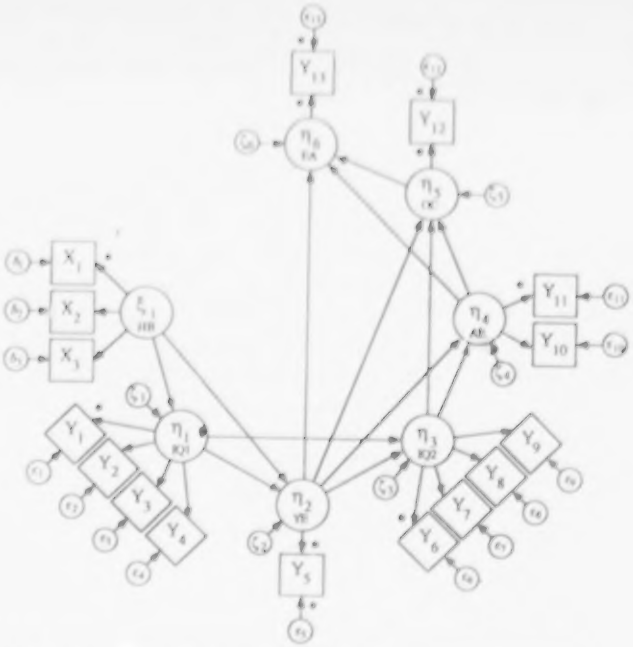

Figure 9.1. Path diagram showing parameters of measurement in a hypothesized model of status attainment.

Note: Table A5.1 and Table A5.2 give summary statistics for the measures specified in the model.

Where * indicates a fixed parameter,

ξ_1 indicates home background (HB);

η_1 indicates cognitive ability in childhood (IQ1);

η_2 indicates youth educational attainment (YE);

η_3 indicates cognitive ability in adulthood (IQ2);

η_4 indicates adult recurrent education (AE1-AE3);

η_5 indicates occupational status (OC1-OC7);

η_6 indicates earned income (EA1-EA7); and

X_1 denotes father's occupational status;

X_2 denotes father's educational attainment;

X_3 denotes father's income;

Y_1 denotes a subtest involving sentence completion;

Y_2 denotes a subtest involving sentence restructuring;

Y_3 denotes a subtest involving word opposites;

Y_4 denotes a subtest involving figure perception;

Y_5 denotes level of formal youth education acquired;

Y_6 denotes a subtest involving concept discrimination;

Y_7 denotes a subtest involving number series;

Y_8 denotes a subtest involving word synonyms;

Y_9 denotes a subtest involving matrices;

Y_{10} denotes adult recurrent education, several periods;

Y_{11} denotes participation (all forms), single periods;

Y_{12} denotes occupational status from age 25 to 56;

Y_{13} denotes *ln* earnings from age 25 to 56.

possible to estimate the effects of adult recurrent education on occupational status and earnings at 25 and 30 years of age. As a consequence, the first two models estimated in this chapter, namely, those of status attainment at 25 and 30 years of age, include six rather than seven constructs.

Organization and Methodology

The approach adopted in this section of the study is to estimate seven models of the status attainment process by employing the method of linear structural relations analysis and similarly measured dependent variables which are based on information collected on different occasions. Table 9.1 designates the seven models of status attainment and indicates both the stages of life career involved and the corresponding ages of the majority of the men in the sample. In Chapter Five details are given with regard to the measurement of the two criterion variables, occupational status and earned income. It can be seen from Table 9.1 that the seven models cover four relatively distinct stages of the occupational career, namely, (1) the so-called period of trial establishment, which is implicated in the model of status attainment at 25 years of age, (2) the period of early career, which is assessed at 30 and 35 years of age, (3) the mid-career period, which involves status attainment at 40 and 43 years of age, and (4) the so-called late or pre-retirement period of life career, in which occupational status and earnings are assessed at 52 and 56 years of age.

It should be noted that the findings of the analyses are, in order to save space, presented alternatively in diagrams and in tables. The variables used in the estimation of the seven models are derived from Data Set 3. Hence, because these variables have no missing values, are measured in similar ways and, also, because the case bases underlying the models are identical since the same 671 men are involved, it is considered meaningful to compare the values of the standardized path coefficients across the seven status attainment models estimated. In this connection, the difficulty of interpreting the unstandardized regression coefficients obtained in this investigation should be noted, since composite variables are employed in the analysis of linear structural relations. However, in order to facilitate the making of comparisons with data sets associated with other samples, unstandardized parameter

Table 9.1
Designations of seven status attainment models by age and stage of the occupational career

Model	Designation	Age	Stage of Occupational Career
1	Model 1953	25	Trial establishment period
2	Model 1958	30	Early career period
3	Model 1963	35	Early career period
4	Model 1968	40	Mid-career period
5	Model 1971	43	Mid-career period
6	Model 1980	52	Late career period
7	Model 1984	56	Late career period

Note: The LISREL 7 program input for each of the models is given in Appendix B

estimates are presented in Appendix A to this monograph. Here, three variables are of particular interest, since they are measured by single indicators. These are (1) youth educational attainment, (2) occupational status and (3) earned income. The appendix of supplementary tables also records the levels of statistical significance associated with the parameter estimates. In the current investigation, because the same significance levels are associated with both standardized and unstandardized path coefficients, the standard errors have not been included in the path diagrams. Furthermore, since the tables and figures included in the present chapter feature *only* significant paths, readers interested in the relative magnitudes and significance levels of parameters considered to be trivial are referred to the supplementary tables included in Appendix A.

The PRELIS computer program (Jöreskog and Sörbom, 1986) is used to test the hypothesis of bivariate normal distributions between variable pairs. Because this hypothesis is rejected in some cases, simple product moment correlations are used in the estimation of the LISREL models. The estimation of each model by using the compensated measures derived from Data Set 3 involves three main stages. In order to provide the reader with the necessary background information for an understanding of how the final LISREL models are developed, the parameter estimates and goodness of fit indices which are obtained at the end of each stage in the analysis of data are produced for the seven models in the statistical supplement to this chapter. The 10 per cent level of probability is used as a minimum threshold level for accepting the goodness of fit of the data to a particular LISREL model. It is

important to emphasize that the seven status attainment models discussed in this chapter are significant at least at the 10 per cent level.

Fully recursive and just-identified models are estimated in the first stage of the model building process. Accordingly, all measurement error covariances are constrained to zero in this step. The modification indices estimated by the LISREL 7 computer program are examined in the second stage to determine whether the inclusion and estimation of a particular error covariance term would substantially improve the goodness of fit of the data to the model. The error constraints which, if set free, would result in a significant improvement are relaxed one at a time, so that eventual changes occurring in other parts of the model can be taken into account in an appropriate way. Then, in the third stage of the analysis, the over-identified path models are estimated. Here, standard error estimates are used to examine whether the probability of obtaining a certain path coefficient is significantly different from zero. The approach subsequently taken is to delete trivial paths from the structural model. Paths with t-values less than 1.5 in magnitude are deleted all at once. The model is then rerun a number of times so that any paths which fail to reach the critical t-value of 2.0, which is used as the threshold level for significance, are removed from the model one by one in ascending order of significance.

Because the first four theoretical variables included in the conceptual status attainment model (see Figure 4.3) are common to the seven LISREL models estimated in the present chapter, an analytical strategy is adopted in which only the observed measures of adult recurrent education, occupational status and earnings are allowed to vary depending on the particular stage of the career cycle under investigation. Thus, it is important to note that the observed variables involved in the measurement of home background (HB), cognitive ability at 10 years of age (IQ1), youth educational attainment (YE) and cognitive ability at 20 years of age (IQ2), which collectively constitute the basis of the status attainment model, remain the same across the seven models investigated.

Table A9.1 in the appendix of supplementary tables shows not only the parameter estimates associated with the basic measurement model described above, but also their levels of statistical significance. It can be seen from this Table that two different measurement models are contrasted with each other, namely, those underlying the status attainment model estimated at age 25 (Model 1953) and the model estimated at age

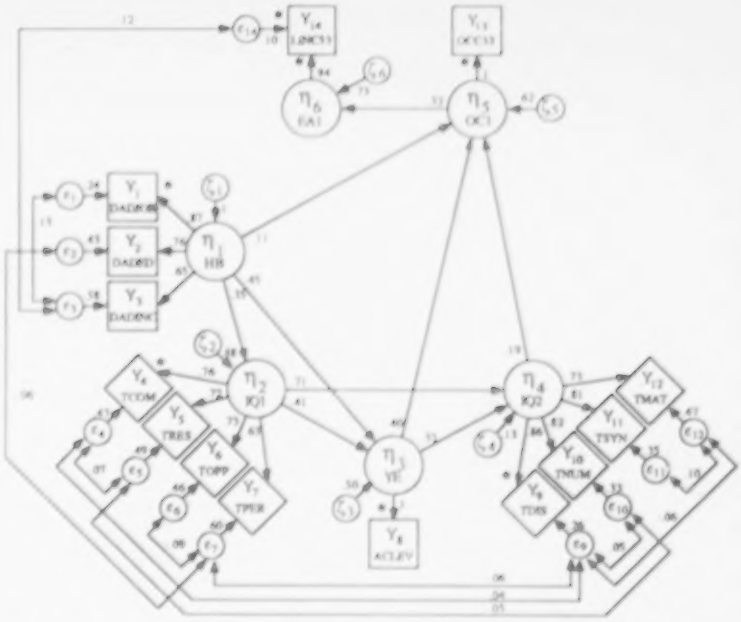

Figure 9.2. Parameter estimates in a model of status attainment at 25 years of age

Notes: (a) Table A5.1 and Table A5.2 give summary statistics for the measures included in the model. (b) Estimates are significant at the five per cent level. Thus, paths not shown are not significant. T-values are given in Table A9.2. (c) Maximum likelihood, standardized solution. (d) The goodness of fit of the model to the data is adequate (χ^2 is 61.6 with 60 degrees of freedom and probability 0.42).

Where * indicates a fixed parameter;

η_1 indicates home background (HB);
η_2 indicates cognitive ability at age 10 (IQ1);
η_3 indicates youth educational attainment (YE);
η_4 indicates cognitive ability at age 20 (IQ2);
η_5 indicates occupational status at age 25 (OC1);
η_6 indicates earned income at age 25 (EA1); and

Y_1 denotes father's occupational status;
Y_2 denotes father's educational attainment;
Y_3 denotes father's income;
Y_4 denotes a subtest involving sentence completion;
Y_5 denotes a subtest involving sentence restructuring;
Y_6 denotes a subtest involving word opposites;
Y_7 denotes a subtest involving figure perception;
Y_8 denotes level of formal youth education acquired;
Y_9 denotes a subtest involving concept discrimination;
Y_{10} denotes a subtest involving number series;
Y_{11} denotes a subtest involving word synonyms;
Y_{12} denotes a subtest involving matrices;
Y_{13} denotes occupational status at age 25 (OCCS3);
Y_{14} denotes *ln* earnings at age 25 (LINCS3).

56 (Model 1984). The data indicate that significant differences exist neither with regard to the loadings and the t-values of the observed variables in measuring the four theoretical variables, nor with regard to the values of the error covariances which are common to the two measurement models. Since these parameter estimates are shown to be stable, it is not necessary to include common error covariance terms in each of the diagrams presented in the current chapter. Significant error covariances associated with the basic measurement model are shown graphically only in the path diagram included in Figure 9.2.

Status Attainment in the Trial Establishment Period

The path diagram in Figure 9.2 shows significant parameters and their standardized path coefficients in the status attainment model estimated at 25 years of age (Model 1953). As was mentioned above, the model is estimated in three analytical stages. These stages in the modification of the model are summarized in Table A9.2 which also shows, besides unstandardized parameter estimates and their t-values, indices of the overall goodness of fit of the data to each of the modified models.

It can be seen from Figure 9.2 that the residual variance in early cognitive ability (IQ1) is 88 per cent. Hence, it can be inferred that home background (HB) explains 12 per cent of the variance in measured cognitive ability. The value of the standardized path coefficient obtained for the effect of home background on early cognitive ability is 0.35, as would be expected from previous research. The diagram also shows that half (0.50) of the variance in youth educational attainment (YE) is accounted for by the two predictor variables. While the path coefficient estimated for the influence of home background on youth educational attainment is 0.45, the coefficient for the effect of cognitive ability is 0.41. If these results are compared with those obtained in the model of youth educational attainment which was estimated in Figure 7.2 in Chapter Seven, then it can be inferred that the two constructs "home support for schooling" (HS) and "rated disposition to learn" (TS), collectively account for five per cent of the variance in youth educational attainment, since 55 per cent of the variance in the criterion variable is explained in this particular path model.

The absence in the diagram of a path from home background (HB) to cognitive ability in adulthood (IQ2) indicates that this influence is not

Table 9.2

Estimated "true" correlations and coefficients of determination (R^2) among the theoretical variables in the basic measurement model

	1	2	3	4	R^2
1 Home Background (HB)	1.00				n.a.
2 Cognitive Ability (IQ1)	0.35	1.00			0.12
3 Youth Education (YE)	0.60	0.57	1.00		0.50
4 Cognitive Ability (IQ2)	0.44	0.89	0.73	1.00	0.87

Notes: (a) The status attainment model is shown in Figure 9.1. (b) The correlations are estimated using the maximum likelihood method. Measurement errors and significant error covariance terms are taken into account. (c) The coefficient of determination (R^2) denotes the amount of variance (per cent) explained by explanatory variables in the dependent variable.

statistically significant once variations in cognitive ability in childhood (IQ1) and youth educational attainment (YE) are held constant. It can be seen from the residual variance (0.13) in cognitive ability at age 20 that early cognitive ability and youth educational attainment explain 87 per cent in this dependent variable. The estimated "true" or corrected correlation between the two theoretical variables which measure cognitive ability is 0.89 (see Table 9.2). This correlation can be considered true, not because it is estimated by using the maximum likelihood approach, but because it is obtained in a structural equation model in which the biasing influences of measurement errors, error covariances and missing data are minimized.

Jencks *et al.* (1979, p. 98) have voiced a suspicion about the size of the correlation coefficient (0.75) between the two variables measuring intelligence which was found in an earlier study (Fägerlind, 1975) involving a part of the data collected in the Malmö Study. Because the correlation estimated by using the Swedish data is lower than those found between adolescent and adult test scores in American studies of representative samples, Jencks *et al.* (1979, p. 98) write that the difference may have arisen because the intelligence test given in childhood was less reliable than the one used for the testing of 20-year-olds. It can be inferred from the loadings associated with the theoretical variables in Figure 9.2 that the four subtests given in childhood were indeed less reliable than the corresponding subtests used at 20 years of age. Moreover, the size of the corrected correlation coefficient (0.89) estimated in the current investigation exceeds the value of 0.80. This finding is of some interest because Bloom (1964) and Jencks *et al.* (1979, p. 97) write that correlations between adolescent and adult test scores are typically at least 0.80.

Besides the coefficients of determination associated with the dependent variables, Table 9.2 also shows the maximum likelihood estimates of the corrected correlations between the theoretical variables included in the basic measurement model. It should be noted that the correlation (0.57) between cognitive ability in childhood (IQ1) and youth educational attainment (YE) is not as strong as that (0.73) between youth educational attainment and cognitive ability in adulthood (IQ2). This finding is further qualified because the correlation between home background and cognitive ability measured in adulthood (0.44) is also greater than the one between home background and cognitive ability in childhood (0.35). Hence, although a high correlation (0.89) has been obtained between cognitive ability in childhood (IQ1) and cognitive ability in early adulthood (IQ2), it is possible that other variables are contributing to this strong association. Because the correlation coefficient does not take intervening factors into account, it cannot be assumed that cognitive ability at 10 years of age is necessarily irresponsive to change or that intelligence is for the most part determined by this age. It is therefore necessary to examine this relationship using regression analysis in a model of linear structural relations, so that the influences of intervening variables can be taken into account and the biasing effects of measurement errors and significant error covariance terms minimized.

It can be inferred from Figure 9.2 that the status attainment model explains 38 per cent of the variance in occupational status (OC1) at 25 years of age (i.e. $1-0.62 = 0.38$) and 27 per cent in earned income (EA1) at 25 years of age. The relative influence of youth educational attainment on occupational status (0.40) is greater than the effect (0.19) of cognitive ability in adulthood (IQ2) on this dependent variable (OC1). Jencks *et al.* (1979, p. 165) employed data derived from the Panel Study of Income Dynamics (PSID) collected in the United States to predict the variable "initial occupational status". They found that home background, cognitive ability tested in adolescence and number of years of schooling, collectively accounted for 32 per cent of the variation in the dependent variable. Although the difficulty of comparing the results of regression analysis across studies involving different samples is acknowledged, the similarity of the findings should be noted.

The parameter estimates shown in Figure 9.2 provide strong support for the thesis advanced by Husén (1951), that cognitive ability as measured by a group intelligence test is not stable between the ages of

10 and 20, but changes significantly between these points in time. Husén's (1951) argument that the amount and quality of educational experiences to which children are exposed between 10 and 20 years of age are implicated in the observed changes in measured intelligence, is also confirmed. The results clearly indicate that cognitive ability in early adulthood (IQ2) is influenced (0.71) not only by cognitive ability in childhood (IQ1), but also by the differentiating effects (0.33) of unequal formal schooling (YE). However, because the analysis carried out in the present study could, at least to some degree, handle problems of analysis arising from autocorrelation, measurement errors and missing data, the parameter estimates obtained in this investigation are more accurate than those found by Fägerlind (1975) in an earlier study based on variables collected in the Malmö Study. Hence, the estimate of the influence of unequal schooling on cognitive ability in adulthood (0.33) must also be considered more accurate than the corresponding estimate (0.45) reported by Fägerlind (1975, p. 65).

Status Attainment in Early Career

Table 9.3 presents path coefficients and their standard errors in the model of status attainment estimated at 30 years of age (Model 1958). The unstandardized regression coefficients as well as the measures of the goodness of fit obtained in the modification of the model are shown in Table A9.3, presented to supplement the data given in this chapter. It can be seen from Table A9.3 that the over-identified model of status attainment at age 30 (Model 1958) has 58 degrees of freedom, which is two degrees less than the model estimated at 25 years of age (Model 1953). This difference has occurred because the influence of youth educational attainment on earned income is significant at age 30 but not at age 25 and also because the error covariance term between earned income and the measure of intelligence involving the solving of number matrices is not assumed to be zero and is estimated in the analysis of the model of status attainment estimated for 30 years of age (Model 1958). If the estimates reported in Table 9.3 are compared with those shown in Figure 9.2, then it can be seen that the effect of youth educational attainment (YE) on occupational status (OC1 and OC2) increases from 0.40 to 0.46 during the period concerned. The comparison also reveals that the influences of cognitive ability in adulthood on occupational status at age 25 and age 30 are the same (0.19 and 0.19).

Table 9.3

Path coefficients and standard errors in a model of status attainment at 30 years of age (Model 1958, maximum likelihood, standardized solution)

Theoretical Variable	1	2	3	4	5	R^2
1 Home Background (HB)						0.12
2 Cognitive Ability (IQ1)	0.35 (0.04)					0.50
3 Youth Education (YE)	0.45 (0.05)	0.41 (0.05)				0.87
4 Cognitive Ability (IQ2)	*	0.71 (0.05)	0.33 (0.03)			0.47
5 Occupational Status (OC2)	0.12 (0.05)	*	0.46 (0.05)	0.19 (0.05)		0.52
6 Earned Income (EA2)	*	*	0.12 (0.04)	*	0.63 (.04)	

Notes: (a) Standard errors in parentheses. (b) Paths marked with an asterisk are not significant at the five per cent level. See Table A9.3 for unstandardized estimates and t-values. (c) The dependent variables are occupational status at age 30 (OCC58) and earnings at age 30 (LINC58). (d) The goodness of fit of the model to the data is adequate (χ^2 is 68.0 with 58 degrees of freedom and probability 0.17). (e) R^2 denotes the amount of variance (per cent) explained by the explanatory variables in the dependent variable.

Figure 9.3 shows significant paths estimated for the next model of status attainment in early career (Model 1963). In this case, the dependent variables are occupational status (OC3) and earned income (EA3), both measured at 35 years of age. The first interesting result is that home background is found to influence occupational status (0.13) and earned income (0.13) independently of the indirect effects of home background, as mediated by youth educational attainment. However, it can easily be calculated from the parameter estimates in the model that the indirect effects of home background (HB) mediated by youth educational attainment (YE) are greater than the direct effects (see also Table 9.7). As a consequence, the resource conversion theory (Fagerlind, 1975) is nevertheless supported, even though the direct effect of home background on occupational status was not anticipated. As expected (see Figure 8.3), youth educational attainment (YE) has a significant effect (0.35) on the amount and quality of job-related adult education (AE1) received by the men followed up in the Malmö Study from 30 to 35 years of age. However, it can be seen from the diagram that the parameter estimate for the path from cognitive ability in adulthood (IQ2) to job-related adult education (AE1) is not significant at this stage in the lives of the men surveyed.

It can be seen from Table 9.3 and Figure 9.3 that the relative magnitude of the influence of youth educational attainment (YE) on occupational status at age 30 (OC2) is approximately similar to the effect of youth education on occupational status at age 35 (OC3), namely 0.46 and 0.45, respectively. Moreover, it can be seen from the

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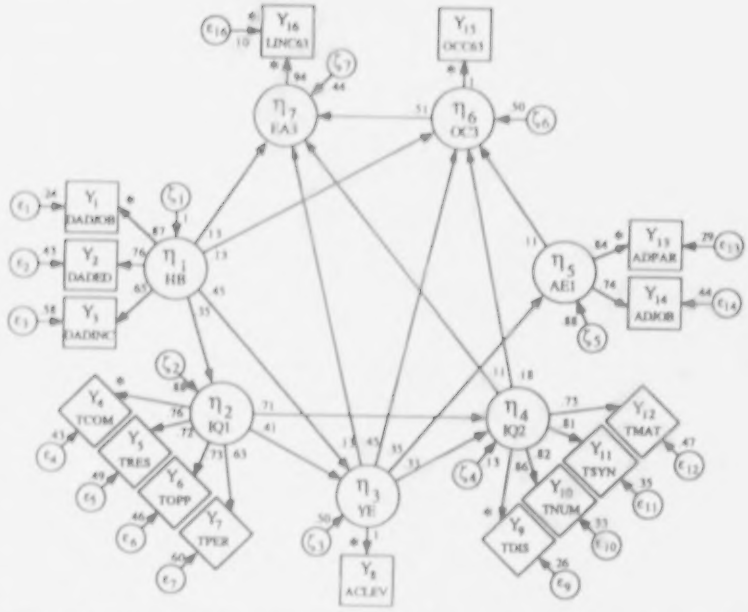

Figure 9.3. Parameter estimates in a model of status attainment at 35 years of age

Notes: (a) Table A5.1 and Table A5.2 give summary statistics for the measures indicated. (b) Estimates are significant at the five per cent level. Hence, paths not shown are not significant. Table A9.4 presents the t-values. (c) Maximum likelihood, standardized solution. (d) The goodness of fit of the model to the data is adequate (χ^2 is 95.8 with 80 degrees of freedom and probability 0.11).

Where * indicates a fixed parameter,

η_1 indicates home background (HB),
η_2 indicates cognitive ability at age 10 (IQ1),
η_3 indicates youth educational attainment (YE),
η_4 indicates cognitive ability at age 20 (IQ2),
η_5 indicates adult education received from age 30 to 35 (AE1),
η_6 indicates occupational status at age 35 (OC3),
η_7 indicates earned income at age 35 (EA3); and
Y_{13} denotes participation (all forms), age 30 to 35 (ADPAR63),
Y_{14} denotes job-related adult education, age 30 to 35 (ADJOB63),
Y_{15} denotes occupational status at age 35 (OCC63),
Y_{16} denotes *ln* earnings at age 35 (LINC63).

diagram in Figure 9.3 that the influence of adult recurrent education (AE1) on occupational status measured at 35 years of age (OC3) is significant but weak (0.11). With respect to the determination of earned income, the effects of youth educational attainment (0.13) and cognitive ability in adulthood (0.11) are small, whereas the influence of occupational status is substantial (0.51). Table A9.4, which is given in

the appendix of supplementary tables, shows the unstandardized path coefficients, the corresponding t-values and indices of the goodness of fit of the data to the modified models of status attainment at 35 years of age.

Status Attainment in Mid-Career

Table 9.4 presents path coefficients and standard errors in the status attainment model estimated at 40 years of age (Model 1968). It can be seen from the data that the direct influence of home background (HB) on occupational status (OC4) is still significant at this age (0.12). However, contrary to the model estimated at age 35 (see Figure 9.3), the path coefficient found for the influence of home background (HB) on earnings (EA4) is not significant at age 40. Compared with the values of the path coefficients estimated at 35 years of age, the effect of youth educational attainment (YE) on occupational status at 40 years of age (OC4) has diminished slightly in magnitude (from 0.45 to 0.39). However, the path coefficient obtained for the influence of youth educational attainment on earnings (EA4) has increased markedly in size during this period, namely, from 0.13 to 0.29.

It can be seen from Table 9.4 that the effects of cognitive ability in adulthood (IQ2) and job-related adult education (AE2) on occupational status at 40 years of age are the same (0.17 and 0.17) at this stage in the analysis of data. In comparison with the result indicated in the model of status attainment at age 35 (see Figure 9.3), the effect of job-related adult education (AE1) on occupational status has increased in relative terms from 35 to 40 years of age, namely, from 0.11 to 0.17. It can also be seen from the data that the path coefficients estimated for the effects of occupational status on earnings are approximately equal at 35 and 40 years of age (0.51 and 0.54). Table A9.5 shows the unstandardized parameter estimates and the t-values which are associated with the model of status attainment at 40 years of age (Model 1968).

Figure 9.4 presents significant path coefficients in a status attainment model estimated at age 43 (Model 1971). It should be noted that the indicators of adult recurrent education (AE2) included in this diagram measure the quality and amount of adult education received cumulatively from 30 to 43 years of age (see Chapter Five). Consistent with

Table 9.4

Path coefficients and standard errors in a model of status attainment at 40 years of age (Model 1968) (maximum likelihood, standardized solution)

Theoretical Variable	1	2	3	4	5	6	R^2
1 Home Background (HB)							
2 Cognitive Ability (IQ1)	0.35 (0.04)						0.12
3 Youth Education (YE)	0.45 (0.05)	0.42 (0.05)					0.50
4 Cognitive Ability (IQ2)	*	0.71 (0.05)	0.33 (0.03)				0.87
5 Adult Education (AE1)	*	*	0.35 (0.04)	*			0.13
6 Occupational Status (OC4)	0.16 (0.05)	*	0.39 (0.05)	0.17 (0.05)	0.17 (0.04)		0.49
7 Earned Income (EA4)	*	*	0.29 (0.04)	*	*	0.54 (0.04)	0.58

Notes: (a) Standard errors in parentheses. (b) Paths marked with an asterisk are not significant at the five per cent level. See Table A9.5 for unstandardized estimates and t-values. (c) The dependent variables are occupational status at age 40 (OCC68) and earnings at age 40 (LINC68). (d) The goodness of fit of the model is adequate (χ^2 is 95.7 with 83 degrees of freedom and probability 0.16). (e) R^2 denotes the amount of variance (per cent) explained by the explanatory variables in the dependent variable.

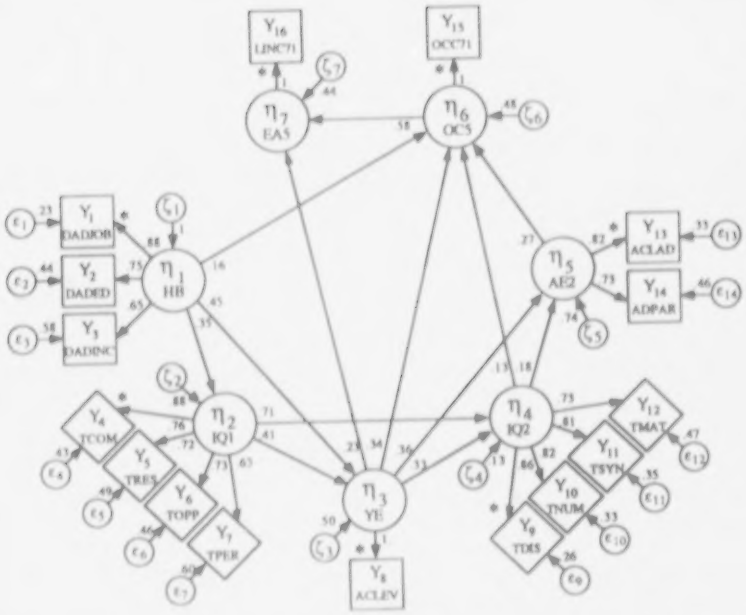

Figure 9.4. Parameter estimates in a model of status attainment at 43 years of age.

Notes: (a) Table A5.1 and Table A5.2 give summary statistics for the measures indicated. (b) Estimates are significant at the five per cent level. Hence, paths not shown are not significant. See Table A9.6. (c) Maximum likelihood, standardized solution. (d) The goodness of fit of the model to the data is adequate (χ^2 is 90.1 with 84 degrees of freedom and probability 0.30).

Where * indicates a fixed parameter,

η_1 indicates home background (HB),

η_2 indicates cognitive ability at age 10 (IQ1),

η_3 indicates youth educational attainment (YE),

η_4 indicates cognitive ability at age 20 (IQ2),

η_5 indicates adult recurrent education from age 30 to 43 (AE2),

η_6 indicates occupational status at age 43 (OC5),

η_7 indicates earned income at age 43 (EA5), and

Y_{11} denotes adult recurrent education, age 30 to 43 (ACLAD71),

Y_{14} denotes participation (all forms), age 36 to 43 (ADPAR71),

Y_{15} denotes occupational status at age 43 (OCC71),

Y_{16} denotes *ln* earnings at age 43 (LINC71).

the models estimated previously, the direct effect of home background (HB) on occupational status (OC5) is also significant at 43 years of age (0.16). The relative influence of youth educational attainment (YE) on adult recurrent education (AE2) received cumulatively from 30 to 43 years of age is approximately equal to the influence of youth education-

Table 9.5

Path coefficients and standard errors in a model of status attainment at 52 years of age (Model 1980) (maximum likelihood, standardized solution)

Theoretical Variable	1	2	3	4	5	6	R^2
1 Home Background (HB)							
2 Cognitive Ability (IQ1)	0.35 (0.04)						0.12
3 Youth Education (YE)	0.45 (0.05)	0.41 (0.05)					0.50
4 Cognitive Ability (IQ2)	*	0.71 (0.05)	0.33 (0.03)				0.87
5 Adult Education (AE3)	*	*	0.24 (0.04)	0.28 (0.07)			0.23
6 Occupational Status (OC6)	0.12 (0.05)	*	0.34 (0.05)	0.10 (0.05)	0.38 (0.05)		0.56
7 Earned Income (EA6)	*	*	0.10 (0.04)	*	*	0.61 (0.04)	0.47

Notes: (a) Standard errors in parentheses. (b) Paths marked with an asterisk are not significant at the five per cent level. See Table A9.7 for unstandardized estimates and t-values. (c) The dependent variables are occupational status at age 52 (OCC80) and earnings at age 52 (LINC80). (d) The goodness of fit of the model is adequate (χ^2 is 98.9 with 84 degrees of freedom and probability 0.13). (e) R^2 denotes the amount of variance (per cent) explained by the explanatory variables in the dependent variable.

al attainment on adult education (AE1) received from 30 to 35 years of age (0.36 and 0.35). However, by mid-career, the effect of cognitive ability at age 20 (IQ2) on adult recurrent education (AE2) has become significant (0.18). Moreover, the influence of youth educational attainment on occupational status at age 43 (OC5) has decreased slightly if compared with the model estimated at age 40 (from 0.39 to 0.34), whereas the effect of job-related adult education has increased (from 0.17 to 0.27). It can also be seen from the data presented in Table 9.4 and Figure 9.4 that the effect of youth educational attainment on earnings at 40 and 43 years of age (EA4 and EA5) has diminished from 0.29 to 0.23. The influence of adult recurrent education (AE2) on earnings at age 43 (EA5) is, however, not significant. Table A9.6 presents the significance levels associated with the path coefficients.

Status Attainment in Late Career

Table 9.5 presents significant parameter estimates and standard errors in a model of the status attainment process at 52 years of age (Model 1980). The direct effect of home background (HB) on occupational status (OC6) is still significant (0.12). The influence of youth educational attainment on adult recurrent education has diminished from 0.36 at age 43 to 0.24 at age 52. Moreover, the effect of cognitive ability at age 20 on adult recurrent education has increased in magnitude from 0.18 at age 43 to 0.28 at age 52. While the influence of youth educational attainment on occupational status at 52 years of age would seem not to have changed during the period which elapsed from 43 to 52 years of age (0.34 and 0.34), the influence of youth educational attainment on earnings has diminished quite markedly from 0.23 at age 43 to 0.10 at age 52. Furthermore, it should be noted that the effect of adult recurrent education (AE3) on occupational status (OC6) at age 52 (0.38) is considerably larger than the corresponding effect of adult education (AE2) on occupational status (OC5) estimated at age 43 (0.27).

Figure 9.5 shows significant paths estimated in the model of status attainment at 56 years of age (Model 1984). It can be inferred from the data that the direct effect of home background (HB) measured at 10 years of age on occupational status (OC7) assessed at age 56 is statistically significant at the five per cent level. Hence, because the direct effect of home background on occupational status is significant in each

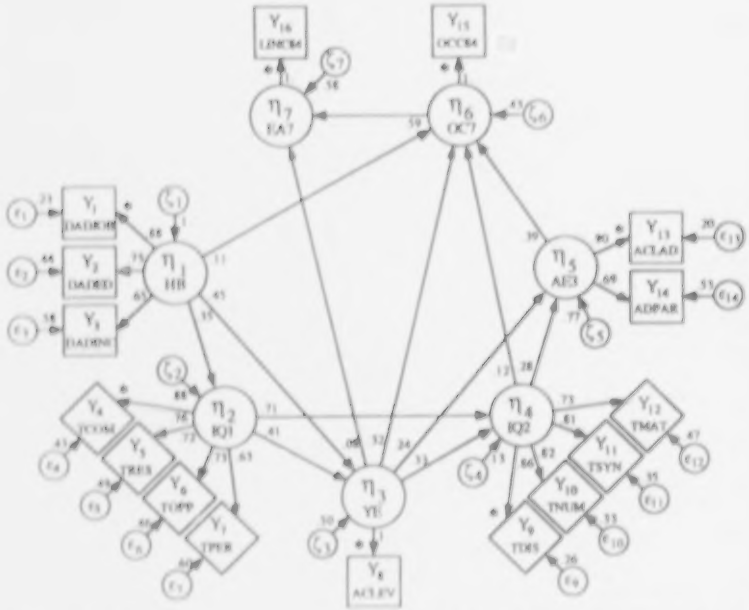

Figure 9.5. Parameter estimates in a model of status attainment at 56 years of age

Notes: (a) Table A5.1 and Table A5.2 give summary statistics for the measures indicated. (b) Estimates are significant at the five per cent level. Hence, paths not shown are not significant. See Table A9.8. (c) Maximum likelihood, standardized solution. (d) The goodness of fit of the model to the data is adequate (χ^2 is 96.4 with 84 degrees of freedom and probability 0.17).

Where * indicates a fixed parameter;

η_1 indicates home background (HB);
η_2 indicates cognitive ability at age 10 (IQ1);
η_3 indicates youth educational attainment (YE);
η_4 indicates cognitive ability at age 20 (IQ2);
η_5 indicates adult recurrent education from age 30 to 56 (AE3);
η_6 indicates occupational status at age 56 (OC7);
η_7 indicates earned income at age 56 (EA7); and
Y_{13} denotes adult recurrent education, age 30 to 56 (ACLAD84);
Y_{14} denotes participation (all forms), age 44 to 56 (ADPAR84);
Y_{15} denotes occupational status at age 56 (OCCS4);
Y_{16} denotes *ln* earnings at age 56 (LNEC84).

of the seven status attainment models estimated in this investigation, it must be concluded that the men who originally came from high status homes have capitalized on this fact in such a way that it has given them a direct advantage which has permeated their entire occupational careers from 25 to 56 years of age. On top of this, it should be noted that additional, less direct reproductive factors are at work to the advantage

of the men who originally came from homes with a relatively high social status. For example, it can be calculated from the data in Figure 9.5 that the cumulative indirect effect of home background on occupational status at age 56, as mediated by cognitive ability and youth educational attainment, is 0.39 (i.e. 0.52−0.13 = 0.39; see Table 9.7). The decisive importance of the home of origin for occupational success across the phases of life career can be illustrated by comparing the total path coefficient (0.52) associated with the effect of home background on occupational status at 56 years of age, which is shown in Table 9.7, with the value of the path coefficient (0.59) obtained in the maximum likelihood regression of earned income at age 56 (EA7) on occupational status measured at that age (OC7).

The estimates involved in Figure 9.5 show that the influence of youth educational attainment (YE) on occupational status (OC7) and earnings (EA7) at 56 years of age has decreased still further if compared with the parameters estimated in the model of status attainment at age 52, namely, from 0.38 to 0.32 and from 0.10 to 0.08. It can be seen from Table A9.8 in Appendix A that the parameter found for the effect of youth educational attainment on earnings at 56 years of age is on the borderline of statistical significance. Moreover, the effect of adult recurrent education (AE3) on occupational status (OC7) at age 56 is slightly more substantial compared with the value estimated at 52 years of age (OC6). It can be inferred from the residuals that the model of status attainment at age 56 explains 23 per cent of the variance in the construct measuring job-related adult recurrent education received cumulatively from 30 to 56 years of age. By comparison, the antecedents of occupational status, collectively, account for 57 per cent of the variance in this criterion variable. The path diagram indicates that the variance explained in earned income, which is about 42 per cent, is by and large accounted for by occupational status.

Corrected Correlations Among Theoretical Variables

Table 9.6 shows the estimated "true" correlations between the theoretical explanatory variables and the criterion variables. Moreover, this table also shows the amount of variance explained in occupational status and earnings measured at seven points in the life careers of the

Table 9.6
Estimated "true" correlations and coefficients of determination (R^2) among theoretical antecedent variables and life career outcomes

Life Career Outcomes	Home Background	Ability Age 10	Youth Education	Ability Age 20	Adult Education	R^2
Occupational Status, age 25	0.43	0.43	0.60	0.53	*	0.39
Occupational Status, age 30	0.48	0.47	0.67	0.58	*	0.47
Occupational Status, age 35	0.48	0.48	0.69	0.58	0.34	0.50
Occupational Status, age 40	0.49	0.46	0.66	0.56	0.38	0.49
Occupational Status, age 43	0.50	0.46	0.66	0.57	0.54	0.52
Occupational Status, age 52	0.46	0.47	0.65	0.57	0.61	0.56
Occupational Status, age 56	0.46	0.48	0.65	0.58	0.62	0.57
Earned Income, age 25	0.22	0.23	0.31	0.28	*	0.27
Earned Income, age 30	0.37	0.37	0.54	0.45	*	0.52
Earned Income, age 35	0.49	0.46	0.63	0.55	0.27	0.56
Earned Income, age 40	0.44	0.41	0.65	0.52	0.31	0.58
Earned Income, age 43	0.43	0.40	0.61	0.50	0.43	0.56
Earned Income, age 52	0.35	0.35	0.50	0.42	0.42	0.47
Earned Income, age 56	0.32	0.33	0.46	0.40	0.40	0.42

Notes: (a) Models in which adult education variables were not specified are indicated with an asterisk. (b) The correlations are estimated using the maximum likelihood fit function. Measurement errors and error covariance terms are taken into consideration. (c) The coefficient of determination (R^2) denotes the amount (per cent) of variance explained by explanatory variables in the dependent variable.

men surveyed in the Malmo Study. One interesting result emerging from the data is that the corrected correlations between the antecedent variables and the measures of occupational status are surprisingly consistent over time. Only the correlations among the variables of adult recurrent education and occupational status do not seem to follow this pattern. This finding can be explained because experiences of adult recurrent education are measured cumulatively. The estimated correlations among the theoretical antecedent variables and the several earnings measures show a remarkable degree of variation over time. The highest correlations are generally found for the associations between youth educational attainment and earnings. Moreover, the correlations are generally higher in mid-career than in the early and late phases of the career cycle.

Cumulative Pathways of Influence

Table 9.7 shows the relative magnitudes of the total, direct and indirect effects of four antecedent variables on two criterion variables. These antecedents are home background (HB), cognitive ability measured at

20 years of age (IQ2), youth educational attainment (YE) and adult recurrent education (AE). The various measures of occupational status (OC) and earned income (EA) from 25 to 56 years of age constitute the two criterion variables. It should be mentioned that the sum of the direct and the indirect effect coefficients constitutes the total effect coefficient (Duncan, 1975). It should furthermore be noted that the direct effect coefficients included in Table 9.7 are unstandardized maximum likelihood estimates. Thus, some minor differences exist between the standardized path coefficients shown previously in diagrams and tables and coefficients reported in Table 9.7.

The data in Table 9.7 indicate that the relationship between home background and occupational status is fairly stable from 25 to 56 years of age, while the total effect of home background on earnings varies substantially. It can be seen that the effect of home background on earnings is the strongest at age 35. Cognitive ability exerts its maximum total effect on occupational status in late career, at 56 years of age, whereas the largest total path coefficient for the influence of cognitive ability on earnings is estimated at the conclusion of early career, at 35 years of age.

The estimates in Table 9.7 clearly indicate that the direct effects of cognitive ability at age 20 on occupational status generally exceed in magnitude the coefficients obtained for the direct influence of home background. These results would seem to indicate the existence of a moderate degree of influence of merit or ability in the status attainment process, were it not challenged by the finding that home background exerts substantial indirect effects, which are in the main mediated by youth educational attainment. As a consequence, it can be seen from the estimates presented in Table 9.7 that the total influence of home background on occupational status is much greater than the influence of cognitive ability. However, the effects of home background include, at least in part, the effects of cognitive ability, since home background influences significantly cognitive ability. Similar results are obtained with respect to earnings. Both home background and cognitive ability exert significant total effects on earnings. The model of status attainment estimated at 35 years of age excepted, the influences of home background and cognitive ability on earnings seem to operate only indirectly, being mediated by both youth educational attainment and occupational status.

Apart from the data described above, Table 9.7 also shows estimates

Table 9.7

Total (TE) and direct (DE) effects of home background, cognitive ability, youth education and adult education on life career outcomes from age 25 to 56 (standard errors, s.e.)

	Home Background		Cognitive Ability		Youth Education		Adult Education	
	TE s.e.	DE s.e.	TE s.e.	DE s.e.	TE s.e.	DE s.e.	TE s.e.	DE s.e.
Occupational Status:								
Age 25	0.49 (.05)	0.12 (.05)	0.22 (.06)	0.22 (.06)	0.46 (.05)	0.40 (.05)	n.a.	n.a.
Age 30	0.55 (.05)	0.13 (.05)	0.22 (.05)	0.22 (.05)	0.52 (.04)	0.46 (.05)	n.a.	n.a.
Age 35	0.55 (.05)	0.13 (.05)	0.21 (.05)	0.21 (.05)	0.55 (.04)	0.45 (.05)	0.13 (.04)	0.13 (.04)
Age 40	0.56 (.04)	0.18 (.05)	0.20 (.05)	0.20 (.05)	0.50 (.04)	0.39 (.05)	0.21 (.04)	0.21 (.04)
Age 43	0.57 (.05)	0.24 (.05)	0.21 (.05)	0.15 (.05)	0.50 (.04)	0.34 (.05)	0.32 (.05)	0.32 (.05)
Age 52	0.53 (.05)	0.1[illegible] (.04)	0.23 (.06)	0.11 (.05)	0.50 (.04)	0.34 (.05)	0.43 (.05)	0.43 (.05)
Age 56	0.52 (.05)	0.13 (.04)	0.27 (.06)	0.14 (.05)	0.49 (.04)	0.32 (.05)	0.44 (.05)	0.44 (.05)
Earned Income:								
Age 25	0.24 (.03)	*	0.11 (.03)	*	0.23 (.03)	*	n.a.	n.a.
Age 30	0.41 (.04)	*	0.13 (.03)	*	0.43 (.04)	0.11 (.04)	n.a.	n.a.
Age 35	0.53 (.05)	0.14 (.05)	0.22 (.06)	0.12 (.05)	0.41 (.04)	0.12 (.05)	0.06 (.02)	*
Age 40	0.47 (.04)	*	0.10 (.03)	*	0.53 (.03)	0.28 (.04)	0.11 (.02)	*
Age 43	0.49 (.04)	*	0.12 (.03)	*	0.52 (.04)	0.23 (.03)	0.19 (.03)	*
Age 52	0.39 (.04)	*	0.14 (.04)	*	0.41 (.04)	0.10 (.04)	0.26 (.03)	*
Age 56	0.36 (.04)	*	0.16 (.03)	*	0.37 (.04)	0.08 (.04)	0.26 (.03)	*

Notes: (a) Trivial direct effects are denoted with asterisks. (b) Adult education was not specified in Model 1953 (age 25) and Model 1958 (age 30). Hence, effect coefficients are not available (n.a.). (c) Because the total effect coefficient is equal to the sum of the direct and indirect effects, indirect effect coefficients can be inferred from the data. (d) Direct effect coefficients are unstandardized maximum likelihood estimates. Hence, minor differences will emerge when these effects are compared with the standardized path coefficients reported previously in path diagrams and tables.

of the total, direct and indirect effects of both youth educational attainment and adult recurrent education on the two dependent variables, occupational status and earnings. These results can be considered to represent the cornerstone of the analyses of data carried out in this monograph. It should be noted that estimates of the standard errors of the total effect coefficients are also presented. The findings regarding the total and direct effects of youth educational attainment and adult recurrent education on life career outcomes such as occupational status and earned income are presented in Figure 9.6 and Figure 9.7 respectively.

Figure 9.6 shows the effects of both youth education and adult recurrent education on occupational status from 25 to 56 years of age. Figure 9.7 presents a similar diagram showing the effects of both youth education and adult recurrent education on earnings. Two points should be kept in mind when interpreting the findings. First, the model controls for the differential influences of unequal home backgrounds and variations in cognitive ability. Second, the goodness of fit to the data of each of the seven models of status attainment in which total effect coefficients are calculated is satisfactory, since the probability that the models deviate from Data Set 3 is not significant. That is, for each model, the probability is in excess of the 10 per cent threshold level for significance commonly employed by research workers using the linear structural relations analysis approach to model building.

The results plotted in Figure 9.6 are interesting in several respects. The direct effect of youth educational attainment on occupational status increases in magnitude during the period of trial establishment from 25 to 30 years of age. Even though this influence is estimated to decrease gradually thereafter, it should be noted that the direct effect of youth educational attainment on occupational status is still quite substantial at age 56 (0.32). Because the influence of adult recurrent education on occupational status is not mediated by other variables in the model of status attainment estimated in this monograph, the total effect of adult recurrent education is equal to its direct effect on occupational status.

The data in Figure 9.6 show that the influence of job-related adult education, which is measured by cumulating the experiences of adult education from early to late career, on occupational status increases gradually over time. The influence of adult education received during the period from 30 to 35 years of age on occupational status at age 35 is

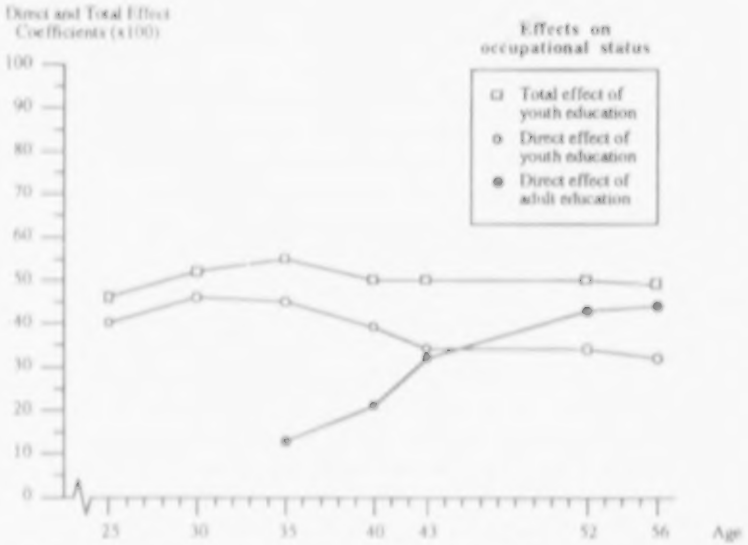

Figure 9.6. The relative importance of youth educational attainment and adult recurrent education in predicting occupational status from age 25 to 56.
Note: Table 9.7 gives the standard errors of the estimates.

significant but weak (0.13). Thereafter, this effect increases markedly in strength, reaching 0.44 at 56 years of age. It can be seen from the diagram that the cumulative but direct influence of adult recurrent education on occupational status at shortly after 43 years of age surpasses in strength the direct influence of youth educational attainment. However, it should be noted that the effect of adult recurrent education can be interpreted as containing a partial influence of youth educational attainment, since the latter influences the likelihood of participation in adult education. Hence, it can be seen from Figure 9.6 that total effect of youth educational attainment on occupational status is surprisingly stable from age 25 to 56, once variations in cognitive ability at age 20 and differences in the amount of received adult education are held constant in the model.

Thus, while the direct effect of youth educational attainment on occupational status decreases in strength at an early stage in the life careers of the men studied, the relative importance of youth educational attainment does not diminish to any significant extent. This finding may be explained as follows. Job-related adult education updates and

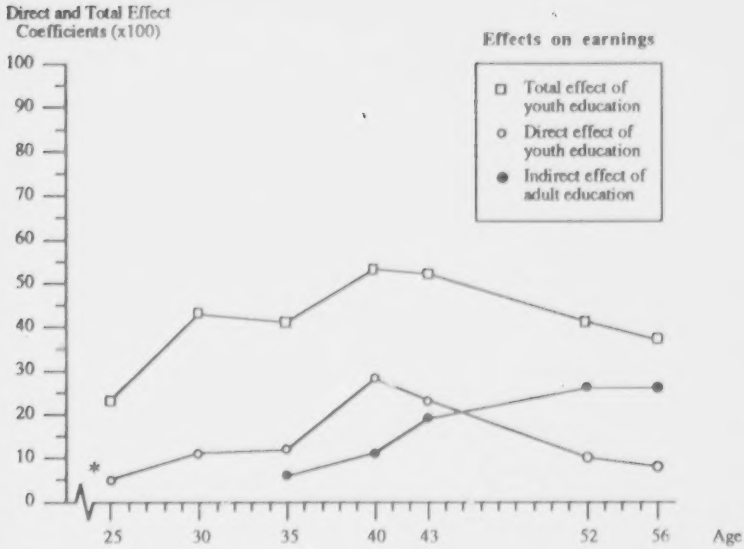

Figure 9.7. The relative importance of youth educational attainment and adult recurrent education in predicting earnings from age 25 to 56.
Notes: (a) Table 9.7 shows the standard errors of the estimates. (b) A value marked with an asterisk is not significant.

reinforces the otherwise diminishing effect of youth educational attainment in such a way that youth education remains a very powerful antecedent of occupational achievement during the later stages in the lives of those surveyed in the Malmö Study. It follows that adult education is implicated not only in the status attainment process by mediating the influences of youth education, but also in the resource conversion process.

Figure 9.7 shows the relative magnitudes of the total effects of both youth education and adult recurrent education on earnings from 25 to 56 years of age. It can be seen that the direct effect of youth education on earnings is not significant at 25 years of age. This finding replicates those obtained from other studies. However, youth education has significant influences on earnings at 30, 35, 40, 43, 52, and 56 years of age. The influence of youth educational attainment on earnings is greatest at 40 years of age. After this age a gradual decrease is observed until 56 years of age is reached. At this point in the life career, the direct effect of youth education on earnings is weak and barely significant (0.08).

Whereas the coefficients associated with the direct influences of adult recurrent education on earnings are not significant at any stage in life career, important differences emerge once the indirect effects of cumulative adult education on earnings, as mediated by occupational status, are investigated. In this case, the total effects of adult recurrent education on earnings are statistically significant from 35 to 56 years of age. The levels of significance associated with these estimates are indicated in Table 9.7. The cumulative effect of adult recurrent education on earnings increases substantially over time. At 43 years of age, the total effect of adult education on earnings (0.19) is close to the estimate of the direct effect of youth education (0.23). However, at 52 years of age, the influence of adult recurrent education on earnings (0.26) surpasses in magnitude the direct effect of youth education (0.10). It should be recalled that, in relative terms, the effects of youth educational attainment on both adult recurrent education and occupational status decrease in strength after mid career, at 43 years of age. As a result, the indirect effects of youth education on earnings as mediated by adult education and occupational status, are not substantial. Because the indirect effects of youth educational attainment are comparatively small, the total effect of youth education on earnings increases until 40 years of age and decreases rapidly thereafter, as predicted by Blaug (1976).

Discussion of Findings

With respect to the hypotheses formulated earlier in this chapter, namely, those concerned with the causal relationships between home background, cognitive ability measured in childhood, youth educational attainment, and cognitive ability measured at 20 years of age, the results are generally supportive. Home background and cognitive ability exert substantial effects on youth educational attainment, 0.45 and 0.41, respectively. As expected, cognitive ability in childhood determines substantially cognitive ability in adulthood (0.71). However, the effect of youth educational attainment on cognitive ability in adulthood is also significant (0.33). Moreover, as was postulated earlier in this chapter, the effect of home background on cognitive ability in adulthood is mediated by cognitive ability in childhood and youth educational attainment. As a result, the study supports the conclusion drawn by

Husén (1951) and Härnqvist (1968) that cognitive ability not only influences youth education, but also, that youth educational attainment, in turn, exerts a substantial effect on cognitive ability measured subsequently to the period during which formal education is received in schools. In this respect, it can be concluded that schools and other educational institutions not only confer knowledge and instrumental qualifications, but also help children to train and develop their intellectual capacity. In conclusion, *Hypotheses One, Three and Four* are confirmed by the analyses of data. Because the effect of home background on cognitive ability in adulthood is indirect rather than direct, and also because the total effect of home background on occupational status is strong, *Hypothesis Two* can also be considered supported by the evidence. However, the magnitude of the total effect of home background on earned income is generally slightly less than was anticipated.

Youth educational attainment and cognitive ability measured at 20 years of age exert significant effects on the quality of adult recurrent education received during subsequent periods. Adult education, as predicted by youth education and cognitive ability, stabilizes the diminishing direct influence of youth educational attainment on occupational status from 43 to 56 years of age. However, since the models explain approximately one-fourth of the variance in adult recurrent education, it should be inferred that adult education operates, at least to a significant extent, independently of home background, cognitive ability and youth education. Thus, *Hypotheses Five* and *Six* are confirmed. However, *Hypothesis Seven* is partly supported and partly rejected by the evidence. The effect of youth educational attainment on earnings is not significant at 25 years of age, as was expected. Moreover, the direct effects of adult recurrent education on earnings are not significant at any stage in the lives of the men surveyed in the Malmö Study. As was hypothesized, occupational status exerts a strong effect on earnings.

Since the direct effect of adult education on occupational status increase in strength from 35 to 56 years of age, the argument that job-related adult education constitutes a factor of importance in the status attainment process is supported. This result could be taken to indicate that previous research in which the effects of youth education on occupational status have been studied without appropriate controls for the influences of job-related adult education are biased as a consequence of misspecification of the model. The findings suggest that the

effects of adult recurrent education on occupational status are, at least in part, independent of youth education. This conclusion is qualified since cognitive ability significantly influences the amount and quality of adult education received from 30 to 56 years of age.

With some reservations, the study supports the idea that adult education provides opportunities for upward career mobility independently of youth educational attainment. Although the results seem to support the hypothesis that adult education has a capacity for offsetting differences in youth education, firm conclusions in support of the "second chance" hypothesis cannot be made because the models investigated in this monograph have failed to control for other factors which may be relevant. Nevertheless, it can be concluded that participation in job-related adult education has advantages especially for older workers, since its effects on life career outcomes are the most substantial late in the lives of the men studied. With respect to *Proposition Area One*, the evidence discussed in the preceding paragraphs seems generally supportive, since the effects of youth educational attainment on occupational status are increasingly mediated by cognitive ability at age 20 and adult recurrent education received later in life.

One part of *Proposition Area Two* is not supported, since the direct effects of youth educational attainment on earnings are still significant at 52 and 56 years of age, which is contrary to the findings expected. However, since the effect of youth educational attainment on earned income is indeed the most substantial at 40 years of age, and also because the effects of cognitive ability in adulthood on earned income are in the main insignificant, *Proposition Area Two* is partly supported.

With respect to *Proposition Area Three*, the findings indicate the following. The hypothesis that adult recurrent education not only exerts direct effects on occupational status but also that these effects increase in magnitude over time is confirmed. With regard to the important question as to whether adult recurrent education influences earnings, the findings generally are supportive. This result is important, not least because it contradicts some studies carried out in the United States. It can be seen from the data presented in Table 9.7 that the direct effects of job-related adult education on earnings are not significant at any stage in the occupational careers of the men surveyed in the Malmö Study. Hence, because the effects of adult education on earnings at 52 and 56 years of age are not significant, as was expected, one part of Hypothesis Ten must be rejected. That is, even though the total effects

of adult education on earnings become stronger over time, they are fully mediated by the positions of individuals in the occupational hierarchy, which is not consistent with the hypothesis advanced. However, it can also be seen from the estimates presented in Table 9.7 and Figure 9.7 that the indirect effects of adult education on earnings, as mediated by occupational status, are significant at measurement points from 35 to 56 years of age. Moreover, the indirect effects of adult recurrent education on earnings surpass in strength the direct effects of youth educational attainment after 43 years of age. Accordingly, *Proposition Area Three* should be considered partly confirmed and partly rejected by the evidence.

The t-values recorded in Table A9.4 show that the path from adult education to earnings at 35 years of age is on the borderline of statistical significance. Regardless of its rather doubtful magnitude, it is interesting to note that the direction of this effect is negative (-0.08). It can be seen from the statistical supplements to this chapter that all path coefficients estimated for the influences of adult education on earnings at 40, 43, 52 and 56 years of age are negative. Even though these influences are too small to pass the threshold level for statistical significance, the fact that the direction of the influence of adult education on earnings is consistently negative in the seven models investigated cannot be ignored. This is in agreement with studies undertaken in the United States which have found training programs to have negative or insignificant effects on the wages of former participants (Dickinson *et al.* 1986; Fraker and Maynard, 1987). This result is explained as indicating that participants incur costs for adult education and training. However, the data also suggest that workers are compensated for their efforts and expense in the long run, by gaining access to occupations with higher levels of prestige and responsibility which usually also carry higher wages.

Summary and Conclusion

This chapter has investigated the cumulative influences of both youth educational attainment and subsequently received adult recurrent education on the occupational careers and earnings of a cohort of Swedish men. These influences were estimated at seven points in time during the period from 25 to 56 years of age. In order to allow for the effects of

other variables involved in the relationships studied, indicators of home background and cognitive ability as measured by group intelligence tests were also included.

At a general level, the findings indicate that the social and environmental resources of the home and cognitive resources are converted mainly through the formal school system into marketable assets (Fägerlind, 1975). Consistent with previous research, acquired level of youth education is found to determine in the main the level of entry into the labour market during the stage of the occupational career referred to as the trial establishment period. Subsequent to 30 years of age, even though the direct effects of youth educational attainment are found to decrease in strength, youth education remains a very powerful determinant of occupational status. Youth educational attainment exerts significant effects also on earnings from 30 to 56 years of age. However, the total effect of youth educational attainment on earnings varies markedly in strength over time. It increases in strength until 40 years of age, after which a rapid decrease is observed. The results also indicate that adult recurrent education constitutes a factor of importance in explaining differences in occupational achievement between workers with similar qualifications, because adult education is found to exert direct effects on occupational status and significant total effects on earnings from 35 to 56 years of age. Furthermore, the data support the conclusion that the effects of adult recurrent education on occupational status and earnings are, to an extent, independent of the effects of youth educational attainment.

The finding that job-related adult education has a substantial indirect effect on earnings implies that studies investigating the effects of adult education and training programs using short term indicators of program impact have underestimated the contribution of adult education, particularly since participants were usually not followed up over a sufficiently long period of time. Hence, studies which have ignored the possibility that programs of adult education and training may have significant indirect effects on earnings in a long term perspective would appear to be misleading.

Chapter 10
Recurrent Education, Job Satisfaction and Well-being

As has been mentioned in Chapters One and Four, it is generally believed that many people participate in programs of adult education, not so much for the sake of career advancement, but rather to develop leisure interests, to enhance their well-being and to increase their satisfaction with life in general. Furthermore, particularly in the Swedish context, it is suggested that firms and other organizations not only regard the provision of job-related adult education and workplace training as an investment in human capital. They also look upon participation in educational programs during worktime as a job reward or fringe benefit and as a means for enhancing the job satisfaction of their employees. The previous chapter has examined the economic and occupational benefits of adult education and training. Apart from investigating life career outcomes, it would also be of interest to test the hypotheses that adult education and training influence people's job satisfaction and general sense of well-being. The review of previous studies presented in Chapter Four has shown that these questions have not yet received the research attention they deserve. Hence, this chapter aims to investigate whether, and to what extent, those who take part in programs of adult education and workplace training score higher on measures of job satisfaction and perceived general well-being compared with those who do not participate in such programs.

Life Descriptions and Measures of Well-being

The development of social indicators has been given some priority by both policy makers and researchers, especially since the mid-1960s. The optimism which characterized the development of the social sciences as policy-oriented fields of research was reflected in much of the early work on well-being and quality of life. Research workers were, initially at least, more concerned with problems of validity and the reliability of the variables used in obtaining information for the

calculation of social indices than with questions of theory and interpretation. The issue of whether the quantification of quality of life in a population was at all meaningful elicited less interest than the technical problems which were encountered in the construction of indicators. As a result, even though general methods have now become available, less headway has been made with respect to the philosophical and theoretical underpinnings of research into the quality of life (Griffin, 1986). It is, unfortunately, beyond the scope of this monograph to discuss in detail the meaning of people's life descriptions and their reports of well-being.

A distinction is commonly made between measures tapping people's "satisfaction" or "happiness" with respect to specific domains of life experience on the one hand, and global reports of the nature and quality of life experiences on the other. For example, Campbell *et al.* (1976) used life descriptions, reports of happiness, and measures of a sense of satisfaction with life to study the quality of life among a representative sample of the adult population in the United States. The instruments used included ten semantic differential scales of seven categories each which asked respondents how they would characterize their lives at present. Eight of these scales were combined into a composite index of general affect. Since the publication of "The Quality of American Life" (Campbell *et al.*, 1976), this index has found extensive application in other investigations.

The semantic differential scales employed by Campbell *et al.* (1976) were, in modified form, included in the questionnaire used in 1984 in the collection of data for the Malmö Study. Some of these scales were also related to those used in a Norwegian survey by Moum (1983). As was mentioned in Chapter Five, the variables initially obtained from the Malmö Study were transformed to five-point scales in order to normalize their distributions. The mean scores and standard deviations of the rescaled measures are shown in Table A5.1 in Appendix A. The frequency distributions are presented in Table A5.2.

Reference Frames and Response Styles

Three major criticisms have been levelled against much quality of life research. The first focusses on the atheoretical orientation of many studies (Allardt, 1976). The second criticism deals with the influence of

reference frames on reports of well-being. Some studies have investigated the influence of expectations and ambitions on life characterizations and on measures of the perceived quality of life (Campbell *et al.*, 1976; Moum, 1983; Herzog and Rodgers, 1986). These studies have generally shown that frames of reference are important for an understanding of the findings. Whether or not a study should aim to control for differences in levels of aspirations depends on the kinds of issues the study seeks to address. This report is not primarily concerned with the prediction of job satisfaction and well-being *per se*. Instead, the aim is to examine whether those who took part in programs of adult education have scored above average on a number of measures of job satisfaction and perceived well-being. Hence, since the purpose is to find out whether particular relationships exist rather than to explain how such relationships might have come about, the influence of frames of reference on reports of well-being are not explicitly taken into account in the analyses of data that follow. However, they are considered implicitly, as was the case with social maintenance perspective inherent to the status attainment model examined in the previous chapter.

The third criticism, which is mainly methodological, focusses on the reliabilities of the measures used to assess dimensions of well-being. Previous studies have shown that self-reported health variables, life characterizations and measures of well-being are beset by systematic errors of measurement (Waldron *et al.*, 1982; Moum, 1983; Butler *et al.*, 1987). A common source of error is associated with the influence of response styles, such as the effect of response acquiescence and trait desirability on self-ratings. Moum (1983) studied the effects of two types of response styles on reports of well-being, namely, "yeasaying" and "naysaying". Whereas yeasaying is defined as the tendency of respondents to agree with a query irrespective of its content, naysaying refers to the inclination to disagree with a question regardless of its content. It was possible in this study to detect inconsistencies in the measures of job satisfaction and perceived well-being. Because contradictory statements were included in the 1984 questionnaire, inconsistent responses could be identified. Table 10.1 shows that only a very small percentage of the respondents gave inconsistent answers to the various questions tapping attitudes to the job and life in general. The data indicate that only one per cent of the respondents was classified as "yeasayers" and another two per cent as "naysayers". The fact that these two groups were mutually exclusive may have arisen because the

Table 10.1
Self-contradictory responses to items measuring aspects of job satisfaction and general well-being

Rank Scale Scores	Response Style Measures Yeasaying %	Naysaying %
3 Strong response inconsistency	0.2	0.7
2 Moderate response inconsistency	0.8	1.5
1 No response inconsistency	99.0	97.8
Total (N)	523	526

Notes: (a) Yeasaying refers to the tendency to agree with a query regardless of its content. (b) Naysaying refers to the tendency to disagree with a question irrespective of its content.

same contradictory statements were employed in the examination of both positive and negative trait desirability.

In the next stage, product moment correlations were computed between the two response style variables and the measures of job satisfaction and well-being. Table A10.1 shows that six of the 17 correlations are statistically significant, which indicates that a small number of responses introduced an important source of variable error in these cases. Different methods are available to minimize the effects of such instances of response error. For example, one possibility would be to carry the response style variables through all stages of the analysis. However, since the number of outlying cases is very small, a less tenuous procedure can be adopted. The approach taken is to replace the original scores of 16 self-contradictory respondents on six measures with the variable grand mean scores. As expected, the outcome of this procedure was that the six correlations became insignificant.

Exploratory Factor Analysis

Unrestricted factor analysis is used in the examination of the data mainly for two purposes. In the first place, the method is used to explore variation and consistency among measures of job satisfaction and well-being. The purpose is to identify the number of theoretical variables underlying the various measures involved. The second aim is to find out how well the measures perform as indicators of their respective theoretical variables. An exploratory factor analysis indicated problems associated with two of the nine semantic differential scales

gathered in 1984 (see Table A5.1). The deviant factor patterns found in the cases of the two scales "life is hard" vs. "easy" and "tied-down" vs. "free" are consistent with the results obtained by Campbell *et al.* (1976), who relegated these diversive items from their "index of general affect". For the same reasons, both scales are excluded from the factor analysis reported in Table 10.2. Moum (1983, p. 163) found that the mean score on the scale "disgusting" vs. "enjoyable" was much lower than that of other semantic differential scales. Table A5.1 shows that a similar result is obtained in the Malmö Study, even though the difference is generally not as large in this case.

Table 10.2 presents the results of an unrestricted and varimax rotated factor analysis involving 14 measures of job attitudes and perceived well-being. The one-factor and two-factor factor patterns are not included in Table 10.2 because the χ^2-values associated with these solutions indicated clearly that they were insufficient to account for the observed correlations used as input. It can be inferred from the goodness of fit indices reported in Table 10.2 that the application of the maximum likelihood procedure to the three-factor and four-factor patterns also would seem to yield unsatisfactory solutions. The scale running from "miserable" to "enjoyable" (item 9) has reasonably high loadings both on the first (0.64) and the fourth factor (0.75) in the case of a four-factor pattern. A similar result was obtained in the case of a five-factor solution, since the scale "discouraging" vs. "hopeful" (item 12) loaded both on the first (0.74) and the fifth factors (0.61). The value of χ^2 decreased with 36.3 points and 10 degrees of freedom when the number of factors was increased from four to five (not shown in Table 10.2). This improvement notwithstanding, there was some indication that the five-factor model was overfitted, since there was just one high loading both on the fourth and the fifth factors (for a discussion, see Munck, 1979, p. 55). Moreover, the semantic differential scale "discouraging" vs. "hopeful" loaded appreciably higher on the first than on the fifth factor. Hence, if all 14 measures were retained for further analysis of a confirmatory type, then the four-factor solution would seem the most appropriate. However, the analytical strategy taken in this study was to exclude those measures which had high loadings on more than one factor, so that a three-factor solution could be examined in a confirmatory model of linear structural relations.

It can be seen from Table 10.2 that the measures describing the respondents' views of life (items 8–14) loaded moderately on mostly

Table 10.2
Factor matrix involving 14 measures of job satisfaction and well-being at 56 years of age

Variable Description	Three-Factor Solution Factor Loadings I	II	III	Unique Variance	Four-Factor Solution Factor Loadings I	II	III	IV	Unique Variance
1 Feelings about the Present Job	0.29	**0.53**	0.29	0.72	0.26	**0.54**	0.28	0.11	0.71
2 Prospects for Future Employment	0.30	0.21	**0.70**	0.51	0.27	0.24	**0.69**	0.15	0.52
3 Risk for becoming Unemployed	−0.02	0.08	**0.26**	0.93	−0.01	0.08	**0.27**	−0.15	0.93
4 I Would Recommend Own Job to Friend	0.13	**0.66**	0.14	0.56	0.13	**0.66**	0.12	−0.01	0.56
5 I Would Take the Same Job Again	0.18	**0.90**	0.12	0.19	0.18	**0.91**	0.09	0.01	0.17
6 I Would Rather Look for a New Job	0.13	**0.65**	0.27	0.58	0.11	**0.66**	0.25	0.06	0.56
7 Perceived Overall Success in Life	0.34	0.29	**0.52**	0.73	0.32	0.31	**0.52**	0.09	0.73
8 Life is Boring ... Interesting	**0.80**	0.20	0.13	0.36	**0.78**	0.21	0.14	0.14	0.39
9 Life is Miserable ... Enjoyable	**0.71**	0.17	0.06	0.50	0.64	0.19	−0.02	**0.75**	0.44
10 Life is Useless ... Worthwhile	**0.82**	0.12	0.12	0.33	**0.83**	0.13	0.15	0.03	0.31
11 Life is Empty ... Full	**0.81**	0.13	0.06	0.34	**0.80**	0.14	0.06	0.13	0.36
12 Life is Discouraging ... Hopeful	**0.78**	0.16	0.20	0.39	**0.78**	0.17	0.21	0.09	0.39
13 Life is Disappointing ... Rewarding	**0.83**	0.15	0.18	0.31	**0.81**	0.16	0.19	0.12	0.35
14 Life is Monotonous ... Facinating	**0.79**	0.17	0.08	0.38	**0.78**	0.18	0.09	0.06	0.39
Chi-square (Degrees of Freedom)			141.2	(52)				89.9	(41)
Probability (Tucker's Reliability)			<0.001	(0.97)				0.007	(0.98)

Notes: (a) Data Set 3, N=671. (b) Unique variance equals unity minus the highest factor loading squared. (b) Bold-faced coefficients indicate the factor on which the highest loading of a particular measure is obtained. (c) The unrestricted and varimax-rotated three- and four-factor patterns are estimated using the maximum likelihood fit function. (d) For Tucker's reliability coefficient, see Tucker and Lewis (1973) and Munck (1979, pp. 54–55).

one factor. Since the seven semantic differential scales involved in the identification and measurement of this common factor can be considered to describe various aspects of the general quality of life, it would seem defensible to employ the generic label "perceived general well-being" (WB) to denote the construct. It can also be seen from Table 10.2 that the factor pattern associated with the seven remaining measures (items 1–7) is fairly stable. Reasonably high loadings are obtained on two factors. Four measures load mostly on the first, namely, feelings about the present job (item 1), I would recommend my own job to a friend (4), I would take the same job again (5) and I would rather look for another job (6). The highest reliability is estimated for the third measure (0.83). It would appear reasonable to use "job satisfaction" (JS) as a comprehensive label for the construct underlying these variables.

The task of interpreting the second job-related factor is more difficult, in part because the loadings of the remaining three measures are not high. Careful examination reveals that the time dimension is common to the three measures. In two cases the time dimension is rather self-explanatory, namely, prospects for future employment (2) and risk for becoming unemployed (3). The third measure, perceived overall success in life (7), is based on a question asking the respondents to compare their situation today with the expectations they had twenty years ago. In view of the characteristics of these measures it seems appropriate to use the label "prospects for career development" (CP) to denote the theoretical variable. However, it can be inferred from the reciprocal of the uniqueness of the three items in measuring prospects for career development (see Table 10.2) that the reliability of the measures is low, namely, 0.48, 0.07 and 0.27, respectively. Hence, it is doubtful whether these measures can be simultaneously employed in a LISREL model.

Comparing Participants in Adult Education with Nonparticipants

Table 10.3 presents the results of an exploratory analysis which seeks to compare the men who participated in adult education with those who did not with respect to their scores on measures of job satisfaction, prospects for career development and general well-being. The analyti-

Table 10.3

A comparison of participants in adult education (Part) with nonparticipants (Nonp) with regard to career prospects, job satisfaction and general well-being

δ = Effect Sizes	Participation Period 1, Age 30–35			Participation Period 2, Age 36–43			Participation Period 3, Age 44–56		
Variable Description	Nonp $\bar{X}$	Part $\bar{X}$	Size δ	Nonp $\bar{X}$	Part $\bar{X}$	Size δ	Nonp $\bar{X}$	Part $\bar{X}$	Size δ
Criterion variables at age 35 and 43:									
1 Feelings about Present Job, Age 35	3.98	4.01	0.03	3.93	4.01	0.07	3.96	4.00	0.04
2 Perceived Success in Life, Age 35	2.68	2.78	0.15	2.66	2.75	0.13	2.62	2.77	**0.22**
3 Feelings about Present Job, Age 43	3.31	3.34	0.04	3.19	3.42	**0.27**	3.24	3.35	0.13
4 Perceived Success in Life, Age 43	2.76	2.89	0.15	2.66	3.01	**0.40**	2.71	2.93	**0.25**
Measures of prospects for career development at age 56:									
5 Prospects for Future Employment	3.64	3.67	0.03	3.60	3.66	0.06	3.40	3.74	**0.33**
6 Risk for Becoming Unemployed	3.43	3.44	0.01	3.40	3.42	0.02	3.22	3.54	**0.32**
7 Perceived Success in Life	2.80	2.80	0.00	2.74	2.82	0.09	2.63	2.87	**0.28**
Measures of job satisfaction at age 56:									
8 Feelings about the Present Job	3.36	3.40	0.05	3.29	3.42	0.16	3.23	3.43	**0.29**
9 I Would Recommend Own Job to Friend	3.64	3.67	0.03	3.60	3.71	0.09	3.48	3.72	**0.20**
10 I Would Take the Same Job Again	3.98	4.01	0.03	3.92	4.04	0.11	3.84	4.05	0.18
11 I Would Rather Look for a New Job	4.12	4.11	0.01	4.04	4.17	0.10	3.96	4.17	0.16

continued

Table 10.3 Continued.

δ = Effect Sizes Variable Description	Participation Period 1, Age 30–35 Nonp $\bar{X}$	 Part $\bar{X}$	 Size δ	Participation Period 2, Age 36–43 Nonp $\bar{X}$	 Part $\bar{X}$	 Size δ	Participation Period 3, Age 44–56 Nonp $\bar{X}$	 Part $\bar{X}$	 Size δ
Measures of general well-being at age 56:									
12 Life is Boring ... Interesting	3.76	3.86	0.08	3.68	3.89	0.17	3.53	3.93	**0.31**
13 Life is Empty ... Full	3.84	3.81	−0.03	3.76	3.85	0.08	3.63	3.89	**0.21**
14 Life is Disappointing ... Rewarding	3.83	3.80	−0.03	3.77	3.87	0.08	3.65	3.92	**0.21**
15 Life is Useless ... Worthwhile	3.87	3.91	0.03	3.81	3.92	0.09	3.71	3.97	**0.20**
16 Life is Monotonous ... Facinating	3.72	3.78	0.05	3.63	3.82	0.15	3.55	3.81	**0.20**
17 Life is Miserable ... Enjoyable	3.93	3.94	0.01	3.93	3.97	0.04	3.90	3.98	0.07
18 Life is Discouraging ... Hopeful	3.69	3.63	−0.05	3.63	3.71	0.07	3.59	3.71	0.09
19 Life is Hard ... Easy	3.09	2.93	−0.12	3.17	2.91	−0.19	3.16	3.00	−0.11
20 Life is Tied-down ... Free	3.74	3.65	−0.07	3.75	3.63	−0.09	3.70	3.68	−0.01

Notes: (a) Underlined indices are significant with values greater than the 0.20 threshold level. (b) The blocked areas indicate relationships between measures of participation in adult education and dependent variables measured immediately subsequent to the period during which participation is assessed. (c) Table A5.1, Table A5.2 and Table A10.2 present further details about the measures concerned. (d) Data Set 1.

cal strategy adopted in Chapter Eight is also used here. Those who took part in adult education and those who did not are compared with respect to their mean scores on dependent variables measured at 35, 43 and 56 years of age. The indicators of adult education involve three periods of time, namely, (1) age 30 to 35, (2) age 36 to 43, and (3) age 44 to 56. Effect size indices are used to denote the standardized difference between the two comparison groups, participants and nonparticipants. Effect size indices with values exceeding the 0.20 threshold are considered to be significant (see the discussion in Chapter Six).

Table 10.3 shows that there are four variables available in the Malmö Study which can be used in an appropriate way to measure job satisfaction and perceived success in life at 35 and 43 years of age. In contrast, 16 variables can be used to indicate prospects for career development, job satisfaction and perceived well-being at 56 years of age. As these constructs cannot properly be identified with the information available from the questionnaires collected in 1963 (age 35) and 1971 (age 43), it is unfortunately not possible to assess the relationships among the theoretical variables in similar ways using analogous variables at three points in time of measurement. Consequently, it is not feasible to develop path models in which adult recurrent education, job satisfaction, prospects for career development and perceived well-being can be estimated and their relationships compared over time.

The data included in Table 10.3 show that those who took part in adult education during the period from 30 to 35 years of age have higher average scores on the measures of job satisfaction (item 1) and perceived success in life (item 2) than those who did not participate. However, because the effect sizes are small, the differences between the participant group and the nonparticipant group cannot be considered significant. More marked differences between the comparison groups are found with respect to the variables measuring job satisfaction and perceived success in life at 43 years of age (items 3–4). Those who participated in programs of adult education and training during the mid-career period from 36 to 43 years of age had a significantly higher mean score on both variables (0.27 and 0.40) than those who were not reached by the adult education system. Since causal inferences cannot be made from effect sizes, the indices can only be interpreted as suggesting that the associations between participation in adult education and the criterion variables concerned are meaningful.

The cell entries in Table 10.3 also demonstrate that those who took

part in adult education during the period from age 44 to 56 scored consistently higher on 14 measures of job satisfaction, prospects for career development and general well-being at age 56. The associations between adult education and the measures of career prospects (items 5–7) and job satisfaction at age 56 (items 8–11) are generally significant, since most effect sizes exceed the 0.20 threshold level. Noteworthy results are also obtained in comparing the groups with respect to their mean scores on the several semantic differential scales (items 12–20). The largest difference (0.31) is estimated for the scale (12) describing in qualitative detail whether the respondents view their lives as interesting or boring. The differences between the mean scores of participants and nonparticipants show that the former group tends to lean toward descriptions characterizing life as "full," "rewarding," "worthwhile" and "facinating" (items 13–16), more than is normal in the population as a whole. The effect sizes also indicate that the two deviating scales mentioned earlier (19–20), namely, "hard" vs. "easy" and "tied-down" vs. "free," do not fit in with the general pattern found in the data. Although the differences between the mean scores are not significant, the negative signs associated with the effect sizes suggest that those who do not take part in programs of adult education and training tend, in the main, to consider life to be both easier and freer than do those in the participant group. It can also be noticed that the differences between the mean scores of the two comparison groups on the items "miserable" vs. "enjoyable" and "discouraging" vs. "hopeful" (17–18) are not significant.

Variations in Job Satisfaction and Well-being by Subgroups

The associations between adult recurrent education, job satisfaction and general well-being are further examined in this section. It is useful to adopt the same analytical strategy as the one used by Campbell *et al.* (1976) in their survey of the quality of life in the United States. They developed composite indices in order to investigate whether there were any systematic dissimilarities in the way the groups involved in the different categories associated with the antecedent variables characterized their life situation and assessed their sense of well-being. The approach taken in the building of composite indices in this investigation

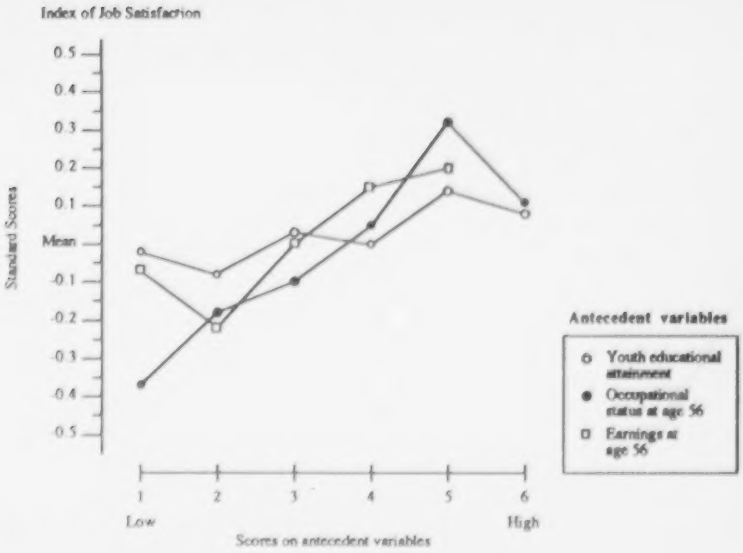

Figure 10.1. Within-group standard scores on the index of job satisfaction at age 56 for three antecedent variables.

consists of two stages. The first step is to estimate the variances and factor loadings of the measures of job satisfaction and general well-being by using the maximum likelihood factor analytic procedure (Spearritt, 1985). In this strategy, the reciprocal of the uniqueness of a variable is used as its weight in the factor analysis, so that the communality of a variable with a high reliability is increased.

Table A10.2 presents the resulting estimates. These indicate that the variances and factor loadings of the measures are similar, at least to a satisfactory degree. In order to enhance the robustness of a composite index, unweighted scoring procedures are commonly employed. In this study, an equal weight of one is given to the scores of respondents on each of the seven semantic differential scales. The mean scores of the respondents on these scales constitute raw score values on the composite index. These raw scores are transformed to standard scores, so that the indices are assigned zero means and a standard deviation of one unit. It should be noted that the resulting distributions of standard scores on the composite indices of job satisfaction and general well-being are negatively skewed.

Figure 10.1 shows mean standard scores on the index of job satisfaction calculated for the groups involved in each of the categories associated with three antecedent variables. These are (1) youth educational attainment, (2) occupational status at 56 years of age, and (3) earnings at 56 years of age. The results should be interpreted carefully because the number of respondents in the various categories differs. The figure shows that the association between youth education and job satisfaction is not significant, since the group mean scores lie around the variable mean. Another pattern is found with respect to occupational status at 56 years of age. Those employed in low status jobs, mainly unskilled and semi-skilled workers, show a markedly less favourable attitude towards their job. By contrast, workers employed in higher status occupations seem, at a general level, to have a more positive attitude to their job. However, the group comprising higher level professionals, administrators, managers and large proprietors deviates from the pattern. With regard to earnings, the results confirm those of Campbell *et al.* (1976) that the relationship between income and job satisfaction is not linear. Figure 10.1 shows that there is an interaction effect in operation which reduces the strength of the association between these two variables, since those with the least income are more satisfied with their job than those immediately above them on the earnings scale. Otherwise, job satisfaction increases with higher income levels.

Figure 10.2 shows a graph indicating mean standard scores on the index of general well-being for the groups involved in the rank ordered categories associated with (1) youth educational attainment, (2) occupational status at age 56 and (3) earned income at age 56. For most groups, the findings generally replicate those obtained in the examination of mean standard scores on job satisfaction. The scores of both the least-educated group and the group with the lowest income level are greater than the overall variable means. With respect to earned income, only the men with incomes in the top 10 per cent of the distribution report a level of well-being much above the average level for the sample. The association between occupational status and general well-being is stable and easy to understand, since those who are employed in higher status occupations tend to score higher on the index.

The data presented in Figure 10.3 are more complex than they appear at a first examination. The figure shows two plots of mean standard scores. The first curve shows mean standard scores on the

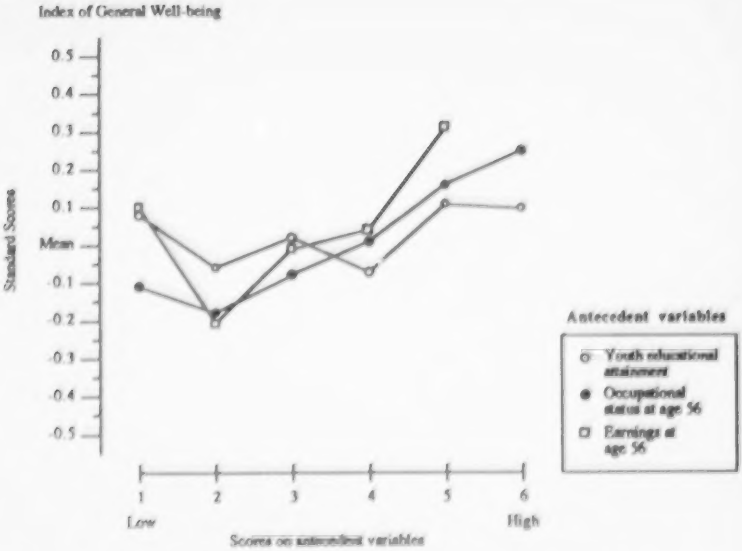

Figure 10.2. Within-group standard scores on the index of general well-being at age 56 for three antecedent variables.

index of general well-being estimated for categories denoting cumulative participation in all forms of adult education during the period from 30 to 56 years of age. The second plot shows mean standard scores on the index of job satisfaction measured at 56 years of age obtained for categories indicating cumulative levels of job-related adult education and training received from 30 to 56 years of age. As can be expected on the basis of the sizes of the effect size indices included in Table 10.3, the data indicate that the frequency and level of participation in programs of adult education (all forms) is positively related to the level of general well-being reported by the men surveyed, since a gradual increase is found in the mean standard scores of the groups on the index of general well-being.

It can furthermore be concluded from the data that the association between the measure of cumulative participation in job-related adult education from age 30 to 56 and the index of job satisfaction assessed at age 56 is problematic. An interaction effect is found which reduces the strength of the association. It is of interest to note that, in this case, the pattern found is opposite to that of the relationship between youth

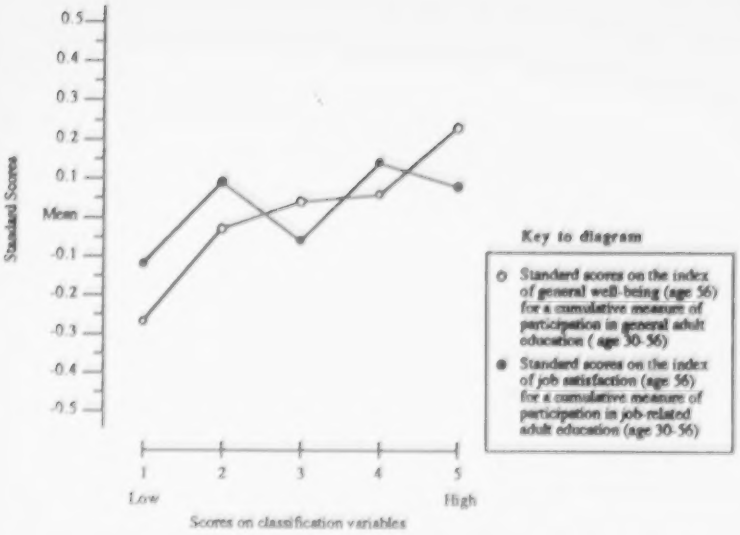

Figure 10.3. Within-group standard scores on the indices of job satisfaction and well-being at age 56 for two classification variables.

educational attainment and the index of job satisfaction shown in Figure 10.1. It can be seen from the plot that those who were not reached by the adult education system during the period investigated (category 1) and those who participated in job-related adult education to an average degree (category 3) scored below normal on the index of job satisfaction. Those in the other three groups scored above average on the composite index. However, those who received the highest level of adult education (category 5) were slightly less satisfied with their jobs than the group involved in the adjacent category (4).

Path Coefficients in a LISREL Model of General Well-being

In order to facilitate a further exploration of the links between youth education, adult education, prospects for career development, job satisfaction and well-being, a path model was developed in Chapter Four. This model is operationalized and estimated in the section that follows.

The hypotheses underlying the specification of variables in the path model were presented graphically in the diagram shown in Figure 4.4. If this conceptual model is contrasted with that of the status attainment model depicted in Figure 4.3, then it will be seen that the hypothesized relationships among the first five constructs included in both models are identical. As the hypotheses guiding the specification of these constructs were tested and discussed in the previous chapter, they need not be repeated here. The following additional hypotheses are examined in the path model of general well-being estimated below (see also Figure 4.4).

Hypothesis One. Cognitive ability, adult recurrent education and occupational status influence prospects for career development (H1).

Hypothesis Two. Adult recurrent education, occupational status, earnings and prospects for career development influence job satisfaction (H2).

Hypothesis Three. Adult recurrent education, prospects for career development and job satisfaction exert direct effects on general well-being (H3).

Figure 10.4 presents standardized path coefficients estimated in the model of general well-being. These estimates are obtained using the maximum likelihood approach and the LISREL method. Table A10.3 in Appendix A shows the unstandardized parameter estimates and their t-values. It can be seen from the t-values that all path coefficients included in Figure 10.4 are statistically significant at the five per cent level. Moreover, the goodness of fit of the model to the data is adequate, since the probability value (0.22) exceeds that of the 0.10 threshold level for significance used in the analysis of data. It should be noted that the composite indices of job satisfaction and general well-being developed previously are not specified. Instead, four observed measures are employed to indicate each construct.

In the case of job satisfaction (JS) all available measures are included in the model (items 10–13). In the case of general well-being (WB), seven appropriate indicators are available for inclusion. However, because the loadings of the measures in indicating general well-being are reasonably high and homogeneous (see Table 10.2), all available measures need not be specified, since the construct in question (WB) can be identified adequately with the use of only four measures. The

following semantic differential scales are incorporated in the path model estimated in Figure 10.4: (14) life is disappointing vs. rewarding; (15) life is boring vs. interesting; (16) life is useless vs. worthwhile; and (17) life is empty vs. full. These scales were selected on the basis of the results obtained in a congeneric factor analytic test model. The rank order of the scales is determined by their estimated reliability in indicating general well-being (see also Table A10.2).

The analysis of the data is limited in two respects. The first is that only measures of job-related adult education are specified (items 5–6). As was mentioned in Chapter Five, the measures of participation in adult education of a general and leisure-oriented type could, for technical reasons, not be included simultaneously with other measures of adult education in a confirmatory factor analysis. Consequently, the hypotheses advanced in Chapter Four concerned with the differential influences of job-related adult education on job satisfaction and leisure-type adult education on general well-being cannot be appropriately tested. The second limitation is that the theoretical variable denoted *prospects for career development* is indicated by only one observed variable, namely, prospects for future employment (item 9). As expected, the specification of the other two measures included in the exploratory factor analysis examined previously (items 3 and 7 in Table 10.2) yielded an unsatisfactory goodness of fit of the model to the data. As only one observed variable is available for inclusion in the model, its measurement error cannot be estimated. Following conventional practice, the reliability of the single measure of prospects for career development (CP) is assumed to be 0.85.

The results indicate that the first hypothesis mentioned above (*H1*) is only partly confirmed. Cognitive ability (IQ2) and occupational status at age 56 (OC7) exert significant direct effects on prospects for career development (-0.18 and 0.36). While the direct effect of adult recurrent education (AE3) on career prospects (0.06) is not significant at the five per cent level, as was hypothesized, its indirect effect mediated by occupational status is significant (0.14). This indicates that the effect of job-related adult education received from 30 to 56 years of age on prospects for career development depends upon the level of the job an employee occupies in the labour market.

The negative influence of cognitive ability on career prospects is rather difficult to explain. As cognitive ability in adulthood (IQ2) has a positive indirect effect (0.10) on prospects for career development (CP)

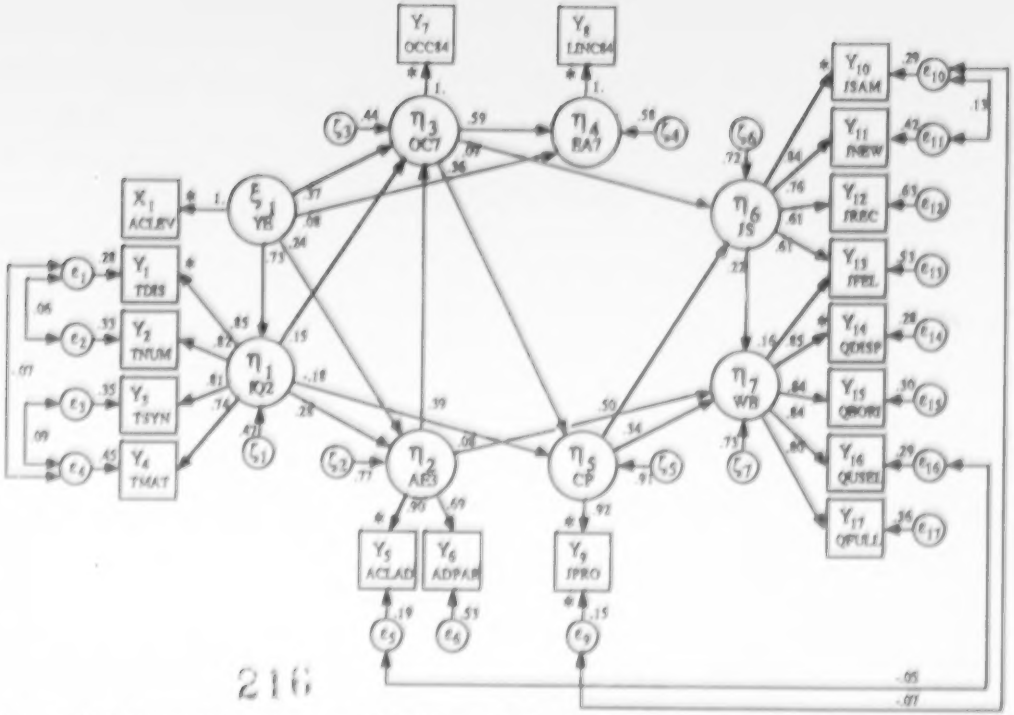

Figure 10.4. Parameter estimates in a LISREL model of general well-being at age 56.

Figure 10.4. Notes: (a) Table A5.1 and Table A5.2 present summary statistics for the measures indicated. (b) Estimates are significant at the five per cent level. Thus, paths not shown are not significant. (c) Table A10.5 shows unstandardized coefficients and their *t*-values. (d) Maximum likelihood, standardized solution. (d) The goodness of fit of the model is adequate (χ^2 is 129.9 with 118 degrees of freedom and probability 0.22).

Where ^{a} indicates a fixed parameter;
ξ_1 indicates youth educational attainment (YE);
η_1 indicates cognitive ability at age 20 (IQ2);
η_2 indicates adult recurrent education (AE3);
η_3 indicates occupational status at age 56 (OC7);
η_4 indicates earned income at age 56 (EA7);
η_5 indicates career prospects at age 56 (CP);
η_6 indicates job satisfaction at age 56 (JS);
η_7 indicates general well-being at age 56 (WB); and
X_1 denotes level of formal youth education acquired;
Y_1 denotes a subtest involving concept discrimination;
Y_2 denotes a subtest involving number series;
Y_3 denotes a subtest involving word synonyms;
Y_4 denotes a subtest involving matrices;
Y_5 denotes adult recurrent education, age 30 to 56 (ACLAD84);
Y_6 denotes participation (all forms), age 44 to 56 (ADPAR84);
Y_7 denotes occupational status at age 56;
Y_8 denotes *ln* earnings at age 56;
Y_9 denotes prospects for future employment;
Y_{10} denotes "I would take the same job again";
Y_{11} denotes "I would rather take a new job";
Y_{12} denotes "I would recommend my own job to a friend";
Y_{13} denotes feelings about the present job;
Y_{14} denotes the scale "disappointing ... rewarding;"
Y_{15} denotes the scale "boring ... interesting;"
Y_{16} denotes the scale "useless ... worthwhile;"
Y_{17} denotes the scale "empty ... full."

mediated by adult recurrent education (AE3) and occupational status (OC7), the negative direct effect (-0.18) in question can have arisen because the gifted men who did not reach a high occupational position in the labour market tended to view their own prospects for career development as more unfavourable than the less gifted groups. Again, this interpretation emphasizes the crucial role of previous occupational attainments. Another possible explanation for the occurrence of the negative effect between cognitive ability (IQ2) and prospects for career development (CP) is methodological. It argues that occupational status, which serves as an important mediating variable for indirect effects, suppresses the influences of other variables in the model. Some inferential evidence in support of this explanation is presented in Table A10.4, since it shows that the estimated correlation between cognitive ability and career prospects (0.04) is not significant. It is doubtful whether a significant path coefficient can be obtained in the regression of two variables which are only weakly (0.04) related. Moreover, the

magnitudes of the observed correlation (0.24) and the estimated correlation (0.26) between occupational status and prospects for career development are not equal to or higher than the total effect coefficient (0.34) found in the regression of the latter (CP)) on the former variable (OC7). When taken together, these facts indicate that a suppressor relationship is in operation in the model.

Noteworthy results are obtained with respect to the prediction of job satisfaction (JS). The diagram in Figure 10.4 shows that neither adult education (AE3) nor earnings (EA7) exert significant direct effects on job satisfaction. It can be recalled in this connection that a similar result was obtained in Chapter Eight in the regression of a measure of job satisfaction on earnings at age 43 (see Table 8.5). The finding that participation in job-related adult education does not directly influence job satisfaction is not surprising. The plot of the association between these variables in Figure 10.3 demonstrates the instability of this relationship. One plausible interpretation is that job-related adult education and training are generally considered by people to relate to an investment rather than a consumption. Job-related adult education sponsored by employers can be regarded by employees as being associated with external demands on their work performance. That is, the main purpose of participating in programs of job-related adult education and workplace training is probably not to have an enjoyable time but, rather, to acquire new knowledge and to update skills believed to be relevant to the work task. Hence, if the motivating factor for participation relates mainly to the external pressure to be optimally efficient and productive at work, then it can be expected that some people will regard training as a rather unpleasant and discomforting necessity. Others with different work values may have a more positive view of such educational programs. Consequently, the finding that job-related adult education does not directly influence job satisfaction could also reflect the fact that recruitment to such programs of adult education does not occur on an entirely voluntary basis. While not surprising, these results indicate that the provision of job-related adult education cannot always be seen as a policy to enhance workers' job satisfaction.

Two variables exert significant direct effects on job satisfaction (JS) assessed at 56 years of age. These are occupational status at age 56 (OC7) and prospects for career development (CP). It can be seen from Figure 10.4 that the direct effect of career prospects on job satisfaction

is strong (0.50) while the influence of occupational status is weak (0.09). This suggests that factors such as job insecurity, uncertainty with regard to the work role and unfavourable prospects for future employment have important negative consequences for job satisfaction. Likewise, good career prospects and job security appear to be associated with positive job satisfaction. The explanatory variables included in the path model explain 28 per cent of the variance in job satisfaction. It can be inferred from the standardized path coefficients and the value of the residual in job satisfaction that prospects for career development alone accounts for one-quarter of the total variance in this dependent variable.

Since adult recurrent education influences occupational status, and since the latter variable is known to influence prospects for career development, it can be postulated that adult education exerts an indirect effect on job satisfaction mediated by occupational status and prospects for career development. The indirect and total effect estimates reported in Table A10.7 indicate that this hypothesis is supported by the evidence. The indirect effect of adult education on prospects for career development is 0.14 and its standard error 0.03. Moreover, the indirect effect of adult education on job satisfaction (0.10) is also significant, since the standard error associated with this relationship has a value of 0.02. The indirect influence (0.18) of occupational status on job satisfaction is, in relative terms, twice as large as its direct effect (0.09). The results described above lend some support for the second hypothesis (*H2*) mentioned previously. The hypothesized paths leading from adult recurrent education, occupational status and prospects for career development to job satisfaction are confirmed by the analysis of the data, even though the path represents an indirect effect in the case of the effect of adult education on job satisfaction. However, as was noted before, with regard to the effect of earned income on job satisfaction, the findings do not support the second hypothesis (*H2*).

As was hypothesized in the path model developed in Chapter Four, the effects of youth educational attainment, cognitive ability in adulthood, occupational status and earned income on general well-being are mediated by other factors in the model. Significant direct effects on general well-being are exerted by adult recurrent education, prospects for career development and job satisfaction. The effect of career prospects (0.34) on general well-being is greater than that of job satisfaction (0.22). It can be seen from the t-values reported in Table A10.3 that the

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influence of adult recurrent education on general well-being (0.08) is small but significant. Thus, adult education exerts a significant direct effect on well-being, indicated by variables measuring the worthwhileness and fullness of life. Table A10.7 shows that the indirect effect of adult education on general well-being (0.06) mediated by occupational status and prospects for career development is also significant (its standard error is 0.01), so that the significance of the total effect of adult education on general well-being is not in doubt. The model accounts for 27 per cent of the variance in general well-being. It follows from the above that the third hypothesis (*H3*) is confirmed, since adult recurrent education, prospects for career development and job satisfaction are found to influence significantly general well-being.

Table A10.4, which is included in Appendix A to supplement the data given in this chapter, shows that the estimated "true" correlations between the theoretical variables in the model. Moreover, this Table also shows the coefficients of determination (R^2) associated with the dependent variables. The estimated correlations between adult recurrent education and both job satisfaction and general well-being are small but significant (0.13 and 0.15). Furthermore, Table A10.5 records the total and indirect effect coefficients and their standard errors which are associated with the influences of both youth educational attainment and adult recurrent education on job satisfaction and well-being. The total effect coefficients generally reproduce the values of the estimated correlations shown in Table A10.4, as would be expected. Relative to the importance of youth educational attainment, the total effects associated with adult recurrent education are, although not large, slightly more substantial. A problem of interpretation exists because the total effects of adult recurrent education on job satisfaction and general well-being are significant (0.10 and 0.14) but small. Hence, while adult education must be considered to influence the dependent variables, more research is needed to validate the existence of a causal network of influence.

Summary and Conclusion

The analysis of data has provided further evidence in support of the hypothesis that participation in job-related adult education enhances occupational careers in the long term perspective. This hypothesis was

initially tested in the status attainment model estimated in Chapter Eight. It is found in the present chapter that the total effect of adult education on a variable measuring people's perceived prospects for future employment is positive and significant (0.14). Thus, higher levels of participation in job-related adult education are associated with more favourable prospects for career development.

Previous studies have found that job satisfaction is only weakly related to income levels, fringe benefits and promotional opportunities offered in the workplace (Landy and Trumbo, 1980; Michalos, 1986). These results are replicated in the present investigation, because any direct effects of earned income and adult recurrent education on job satisfaction are not found. However, it is important to note that the indirect effect of adult education on job satisfaction is found to be statistically significant (0.10). Hence, it is apparent that some ambiguity remains with regard to the question as to whether the provision of job-related adult education and workplace training enhances workers' job satisfaction, since only a weak indirect effect is estimated in the path model.

The hypothesis that adult education influences significantly the way people assess their own life situation and evaluate their personal well-being is confirmed. Adult education exerts both a direct effect (0.08) and an indirect effect (0.06) on well-being. The results obtained in comparing the mean scores on measures of well-being of participants in adult education with those who were not reached by the system show that the participant groups tend consistently to lean toward descriptions characterizing life as being "interesting," "rewarding," "full," "worthwhile" and "facinating," to a greater extent than the total population. Substantial influences on general well-being are exerted by prospects for career development and job satisfaction. In this connection, it is worth noting that the construct "prospects for career development" is the more important factor of the two, since the total effects of career prospects and job satisfaction on general well-being are 0.42 and 0.22, respectively. It must be concluded that feelings of job security, positive expectations associated with good prospects for future employment and job satisfaction are important factors in explaining the differences in people's self-ratings on semantic differential scales measuring expressions of general well-being.

The analysis of data presented in this chapter should be regarded as exploratory. Limitations arose because the data were not sufficient to

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estimate all constructs required for the path model in an adequate way, so that comparisons over time could not be attempted. It is apparent that additional data are needed. In view of the nature of the questions addressed, it would seem that initially qualitative data collected by means of interviews would be most useful for future research into the relationships among adult recurrent education, career prospects, job satisfaction and general well-being. Subsequently, appropriate scales need to be developed.

Chapter 11
Conclusion

During the past two decades arguments have frequently been advanced to support the expansion of formal adult education and opportunities for in-service training and the development of human resources in the workplace. Yet, despite the widely held conviction that adult education contributes to economic development, provides greater equality of educational opportunity, enhances occupational careers and promotes individual earnings, job satisfaction and general well-being, evidence concerning the nature and magnitude of these linkages is very limited. However, if the claims are correct, then significant long term effects of youth education and adult education on occupational status, earnings, job satisfaction and well-being should be clearly observable.

The overall purpose of this study has been to investigate the role of adult education in complementing and mediating the effects of formal youth education on the life chances, job satisfaction and general well-being of the cohort of Swedish men surveyed from 1938–37 to 1988 in the Malmö Study. To examine these effects, four different but conceptually related path models have been proposed and their parameters estimated, employing individual-level data and linear structural relations analysis. The models have been developed in accordance not only with theories of the relationships among antecedent factors, participation in recurrent education and educational outcomes, but also on the basis of findings obtained in previous studies. Each model addressed specific problems. These problems corresponded to the four aims of the study, which were spelled out in Chapter One.

The investigation was restricted to data for the male population surveyed in the Malmö Study. The population initially consisted of 834 men. However, due to case loss and nonresponse, data on 671 or 80 per cent of these men were available for this inquiry. Hence, it was imperative to find out whether and to what extent those for whom data were not available differed systematically from those who remained, since the parameter estimates obtained from the data could be seriously biased as a result of the losses. A detailed analysis of missing data demonstrated that the biasing effects of nonresponse were more sub-

stantial at the item level than at the questionnaire level. However, as the effects of the losses on the measures were shown to be small, there was some justification for the conclusion that case loss was without major consequences for the analyses of data carried out in the present study.

Because of the variation in the number of cases associated with the different measures involved, a methodological problem arose in the testing for statistical significance of parameter estimates. To overcome this problem, a multistage strategy of compensation for missing data was employed. In this approach, values for missing data were computed using procedures that could be demonstrated empirically to produce the best estimate of a particular statistic. The outcomes of data compensation were assessed with regard to a number of criteria. An examination of differences among parameters in a model estimated by using different data sets indicated that the measures included in the reduced and compensated data set (N=671) generally performed as well as, or in some instances even better than, the original data set (N=834) which contained unadjusted measures with missing values for some observational units. Hence, the approach adopted in this investigation has been to employ 671 cases which were considered to be drawn from the original population. This data set incorporated the compensations made where data were missing as a result of nonresponse to particular items and on particular occasions.

Key Findings of the Study

From the discussion in Chapters Two and Four of theories of recurrent education, hypotheses were advanced in the concluding part of Chapter Four to guide the inclusion of variables in the conceptual models. However, time-related hypotheses were stated subsequently in chapters concerned with the estimation and testing for statistical significance of the parameters in the hypothesized models. The results obtained from the testing and estimation of the model of youth educational attainment were discussed and summarized at the end of Chapter Seven. Research findings were also presented in Chapter Eight, in which two models predicting participation in recurrent education were examined and their parameters estimated. Chapters Nine and Ten were concerned with the effects of both youth education and adult education on life career

indicators, in the former chapter, and effects on job satisfaction and well-being, in the latter chapter.

Hence, the summary of research findings presented in the paragraphs that follow is limited only to those with a direct bearing on the aims of the study and the more important time-related propositions. It should be noted that the hypotheses listed serve as summaries. They are therefore not put in exactly the same words as those stated in the previous chapters.

1. *Youth Educational Attainment*

Proposition 1. The interest taken by parents in their child's school career has a significant positive effect on youth educational attainment.

Proposition 2. Parents who express a higher level of aspiration with respect to the schooling of their children than others attempt to offer them an educational advantage by interacting with teachers and by influencing the way teachers assess student disposition to learn.

Proposition 3. Home background influences teachers' assessments of student disposition to learn only indirectly, as this effect is mediated by parental apirations with regard to their children's educational careers.

Proposition 4. Teachers' assessments of student disposition to learn have a significant positive effect on subsequent educational attainment, even after variations in cognitive ability measured by intelligence test scores held constant.

The results presented in Chapter Seven (Figure 7.2) support Proposition One that parental aspirations have a positive effect on subsequent educational attainment, even after the effects of home background are controlled for. The direct effects of home background measured by the education, occupation and income of the father are, in relative terms, about twice as important as the influence of parental aspirations. These results are consistent with those obtained by Keeves (1972), DiMaggio (1982) and Teachman (1987). The aspirations of parents with respect to their children's educational careers influence subsequent educational attainment even after allowance has been made for the effects of home background. These empirical findings confirm Propositions One and

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Two. Moreover, Proposition Three is supported because home background does not directly influence student disposition to learn and, also, since parental aspirations relate to differences in the way teachers assess student disposition to learn. However, the related hypothesis, which is not formally stated, that the influence of parental aspirations on teachers in the long run also produces an educational advantage is rejected, since this influence on subsequent educational attainment as mediated by teacher assessments is not significant. Finally, the data support Proposition Four, since student disposition to learn has a positive long term effect on early educational attainment.

2. *Adult Recurrent Education*

Proposition 5. Home background, cognitive ability as assessed in childhood, early income and job satisfaction exert significant indirect effects on later participation in adult education. These influences are mediated by significant direct effects on participation of youth education, occupational status and expressed interest in adult education.

Proposition 6. Youth education has significant positive effects on participation in adult education. These effects diminish in strength over time, so that youth education predicts more strongly participation during the early stage of life career and less strongly participation during a later stage.

Proposition 7. Early participation in adult education has significant positive effects on subsequent participation. Relative to the diminishing effects of youth education, the effects of early on later participation become stronger over time.

Proposition Five is partly supported and partly rejected by the evidence presented in Chapter Eight. Significant positive effects on participation in adult education from 35 to 43 years of age are found for youth education, early occupational status and expressed interest in adult education. Moreover, significant indirect effects are found for home background and cognitive ability in childhood. However, the indirect effects of earnings and job satisfaction are not significant.The research findings with respect to participation from 44 to 56 years are largely the same as those obtained in the mid-career path model described earlier. The important differences are that (1) the direct effect of youth education on adult education received from age 44 to 56 is not

significant, (2) cognitive ability has a significant direct rather than an indirect effect on participation, and (3) youth education has an indirect effect on participation during the period from 44 to 56 years of age. The latter finding has relevance for Proposition Six.

The following results are obtained from the model of the recurrent education cycle examined in Chapter Eight. The path coefficients associated with the direct effects of youth education on adult education are positive and significant for all three periods during which participation is measured. However, the effects of youth education on participation in adult education during the late-career period from 44 to 56 years of age are smaller than those of youth education on participation during the early and mid-career periods. Accordingly, the influence of youth education on participation in adult education late in the life career of the individual is mediated by other variables in the model. In this study, early participation is the most significant predictor of later participation. The predictive power of early participation increases with increasing age, as was hypothesized in Proposition Seven. In conclusion, the findings support the view that the effects of educational experiences acquired in a recurrent education cycle are *cumulative*.

3. *Occupational Status and Earnings*

Proposition 8. Youth education has significant positive effects on occupational status from early to late career, in this case from 25 to 56 years of age. These effects are strongest during the early stage of life career and then diminish with age.

Proposition 9. Adult education has significant positive effects on occupational status from early to late career. These effects increase in strength with advancing age, so that adult education predicts more strongly occupational status at 56 years of age and less strongly occupational status at 35 years of age.

Proposition 10. Cognitive ability has significant positive effects on occupational status from early to late career. While the effects of youth education on occupational status diminish and those of adult education increase with age, the effects of cognitive ability on occupational status are fairly stable over time.

Proposition 11. Youth education has positive influences on cognitive ability in adulthood and adult education. While the direct effects of

youth education on occupational status diminish over time, the total effects of youth education on occupational status remain strong, as these effects are increasingly mediated by cognitive ability and adult education with advancing age.

Proposition 12. Youth education has significant positive effects on earnings from the early to the late stages of life career. These effects increase in magnitude from 25 to 40 years of age and decrease thereafter.

Proposition 13. Adult education does not directly influence earnings. However, adult education has indirect effects on earnings mediated by occupational status. Because the effects of adult education on occupational status become larger with age, the indirect effects of adult education on earnings also increase over time.

The results obtained in the estimation of seven status attainment models in Chapter Nine confirm Propositions Eight and Nine. Consistent with the findings of Featherman and Hauser (1978), the effects of youth education on occupational status are strongest during the early career stage (age 30) and diminish gradually thereafter. Relative to the diminishing effects of youth education on occupational status over time, those of adult education increase substantially with increasing age, as was hypothesized. Proposition Ten is also supported. Cognitive ability assessed in early adulthood has significant positive effects on occupational status from 25 to 56 years of age. It should be noted that the total effects of cognitive ability on occupational status do not vary much from the early to the late stage of life career.

The research findings with respect to Proposition 11 indicate that adult recurrent education has mediated the diminishing effects of youth education. Consequently, some of the effects of adult education on occupational status is due to the level of formal education *initially* acquired. Furthermore, the total effects of youth education on occupational status remain stable from 30 to 56 years of age. With respect to Propositions 12 and 13, the models estimated in Chapter Nine support Blaug's (1976) thesis, that the effects of youth education on earned income increase with age up to a point somewhere around 40 years of age and diminish thereafter. The results also demonstrate that the direct effects of adult education on earnings from 25 to 56 years are not statistically significant at any point in the life careers of the men

studied. However, it is interesting to note that the *indirect* effects of adult education on earnings mediated by occupational status are positive. Consistent with Mincer's analysis of the relationships between early schooling, work experience, age and earnings (1974), the indirect effects of adult education on earnings are found to increase gradually with increasing age.

4. *Job Satisfaction and Perceived Well-being*

Proposition 14. Cognitive ability, adult education and occupational status at 56 years of age influence significantly prospects for career development in the future.

Proposition 15. Adult education, occupational status, earnings and prospects for career development influence significantly job satisfaction at 56 years of age.

Proposition 16. Adult education, prospects for career development and job satisfaction influence significantly self-perceived well-being at 56 years of age.

The results obtained in Chapter Ten are in several respects ambiguous. Two of the three relationships predicted in Proposition 14 are confirmed. Cognitive ability and occupational status have positive effects on prospects for career development, as was expected. However, while the direct effect of adult education on career prospects is not significant, the total effect mediated by occupational status is weak but significant. The results obtained with regard to Proposition 15 indicate that the direct effects of adult education and earnings on job satisfaction are not conclusive, while those of occupational status and prospects for career development are significant. Hence, the weak total effect of adult education on job satisfaction depends, first, on the status associated with the present occupation and, second, on whether the job provides some opportunity for future career development. It would appear that a policy of enhancing job satisfaction by providing workers with opportunities to take part in programs of job-related adult education is likely to fail, unless the adult education activity leads to a new job with higher status or to prospects of acquiring a more desirable job in the future.

Adult recurrent education, prospects for career development and job satisfaction influence general well-being. Therefore, Proposition 16 is

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supported by the analyses of data presented in Chapter Ten. However, it should also be noted that the effect of adult education on self-perceived well-being at 56 years of age, although significant at the five per cent level, does not explain much of the variance in this dependent variable. Nevertheless, the evidence shows that the men who participated in adult education tended to view their lives as more "full," "worthwhile," "rich," and "interesting" than those who did not take part in such activities. That adult education is found to relate to well-being is an important finding, not least because many other factors can be expected to influence this variable. The significant, albeit weak, effect of adult education on general well-being supports the claim made in Chapter One, that the purpose of adult education is not restricted to one of conferring knowledge and skills for career mobility.

Implications for Education Theory

In his treatise on social capital in the creation of human capital, Coleman (1988, p. 109) separates analytically home background into three different components: financial, human and social capital. According to Coleman, the social capital of the family is defined not only by the relations among parents, children and the community, but also by the quality of aspirations, expectations and obligations parents have with respect to the schooling of their children and by the interchange of information between parents and teachers within the school system. It can be inferred from the results presented in Chapter Seven that parental aspirations influence formal educational attainment, when home background, defined as comprising both human capital (the education and occupation of the father) and financial capital (father's income), is held constant. The flow of information from parents to teachers and from teachers to parents has an effect on the way teachers assess student disposition to learn. Because this effect operates independently, in the main, of the financial and human capital of the home, the findings can be interpreted as lending some support to the social capital theory advanced by Coleman (1988). The results are consistent also with those obtained from other studies in which the separate effects of different components of home background on educational attainment were examined (DiMaggio and Mohr, 1985; de Graaf, 1986).

The evidence arrived at in a great number of studies, namely, that

socially determined inequality of opportunity and inequality of outcomes are reinforced and rendered legitimate by the ascriptive practices of formal schooling, is now generally recognized by policy makers and research workers in education. As the review of previous studies in Chapter Four showed, much less is currently known about the role of adult education as a stratifier in modern society. The results of this study inevitably give rise to the question whether and to what extent adult education, on the whole, contributes to or mitigates against the maintenance of social inequality across generations that would appear to operate through the process of formal schooling.

The results obtained in Chapter Nine indicate that adult education can facilitate upward occupational mobility. This inference is justified because the path coefficients estimated in the regression of occupational status on measures of adult education are positive and moderate particularly in late career, even with the influences of home background, cognitive ability and youth educational attainment held constant. Moreover, the total effects of cognitive ability assessed at 10 years of age on participation in adult education from 30 to 56 years of age (0.39) are slightly larger than those of home background (0.27) and youth education (0.30). Hence, although the total effects of home background and youth educational attainment on participation in adult education are clearly significant, cognitive ability is a comparatively strong predictor of participation in adult education. This result can be considered to give some support to cognitive-based theories of participation (Rubenson, 1987b). Another research finding is that the antecedent variables explain between 16 and 19 per cent of the variance in simple dichotomous measures of participation in adult education.

The conclusion that adult recurrent education to an extent operates independently of antecedent variables such as home background, cognitive ability, youth education, occupational status, earnings and job satisfaction has implications for theories concerned with financial, situational and structural barriers to participation (Cross, 1981). For example, since expressed interest in adult education has only a weak effect on later participation in adult education while the level of earnings does not have any effect at all, it can be inferred that financial barriers are likely to be of less importance in explaining nonparticipation than are impediments of a psychological nature.

The research results also support the resource conversion theory initially advanced by Coleman (1971). According to this theory, the

resources a person has access to during childhood, such as the social, economic and cultural assets of the home and cognitive ability, are converted into marketable resources mainly through the process of formal schooling. The coefficients estimated in the path models can be interpreted as providing three important findings. First, youth education mediates the influences of home background and cognitive ability assessed in childhood on indicators of life career outcomes. Second, formal schooling produces cognitive outcomes which, in turn, influence participation in adult education. Third, occupational status, earnings, job satisfaction and general well-being depend, at least in part, on the causal network of influences operating through both youth education and adult education.

In Chapter One the issue was raised whether and to what extent adult recurrent education augments, mediates or diminishes the role of youth education as an important stratifier in society. It is concluded that adult education throughout adds to the effects of youth education. There is a meritocratic appeal which is implicit in the evidence that cognitive ability is involved in the relationships between home background, youth education and adult education. However, the findings of the study do not support the claim that adult education served to level out social group differences in educational opportunities and attainments among the men investigated. Those members of the cohort with a formal education beyond primary school and those with higher social backgrounds took more frequently part in programs of adult education than those with a compulsory minimum of formal education and those coming from low status homes. Accordingly, the research results can be interpreted as supporting both the status attainment and the structural maintenance theories reviewed in Chapter Two. Adult education constitutes a link between the social class membership of the father and that of the son. Thus, adult education not only influences the allocation of individual men to distinct occupational and economic positions in society but also influences the intergenerational processes involved.

Nevertheless, this fact does not negate the importance of adult recurrent education in the provision of educational opportunities in society. That adult education does not seem to help make a generation of Swedish men more equal is not surprising. Because participation in adult education is mostly voluntary, it would be unrealistic to expect that adult education can compensate for unequal home backgrounds, unequal cognitive resources, and unequal schooling. Moreover, if adult

recurrent education is designed mainly to make the system of education more responsive to the demands of the labour market, as hypothesized by Carnoy and Levin (1985), then programs of adult education and workplace training may well be subject to social forces producing outcomes contrary to those of equality.

Implications for Future Research

The data set available for analysis in this study is in many ways unique and permits the examination of questions that have not previously been addressed. As some of the results obtained in this investigation are new and not supported by previous research, they should be interpreted cautiously. Further research drawing upon other populations is clearly needed to establish the existence of causal networks of the types considered in Chapter Four. This is particularly true with respect to the role of adult education in mediating and complementing the effects of home background, cognitive ability and youth education on life career outcomes, job satisfaction and general well-being.

This validation would require, initially, replication studies using data relating to other, preferably more extensive Swedish populations. Fortunately, there are other longitudinal studies in operation in Sweden in which data involving adult education have been collected for large representative samples of Swedish students. Secondly, more research into the long term effects of both youth education and adult education employing comparable data collected in other industrial societies needs to be carried out. In this regard, it would not be very productive to wait until longitudinal data of the same type and quality as those collected in the Malmo Study become available for the modelling of the effects of recurrent education in other industrial societies. The planning of a less elaborate, less time consuming and especially less expensive research design should therefore be given priority.

This inquiry has shown that some of the effects of adult recurrent education only become discernible if participation is measured over a long period of time. This is so in the case of the effects of adult education on earnings. Thus, high demands are made on the quality of the data required for studies into the effects of adult education in a *system* of recurrent education. Accordingly, of high priority for future research is the sampling of populations free of selection bias which involve both participant and nonparticipant groups. In addition, the

collection and analysis of appropriate data which allow for the estimation of the effects of youth education and adult education and which employ a time perspective spanning a sufficient number of years is also of high priority.

Besides the validation of the findings of this study, future studies should evidently attempt to extend the scope of the research program by asking questions and examining data which involve and are relevant to *women*. Given that prior research has shown that women tend to take part in programs of adult education for different reasons from those reported by men (Boshier and Collins, 1983), and that there are significant gender differences in the labour market outcomes of education (Acker, 1984; Fägerlind and Saha, 1989), research into the role of adult education in women's occupational attainment should be given high priority (Felmlee, 1988). Furthermore, there is a clear need to estimate the effects of other factors in models of adult recurrent education. Previous inquiries have found additional factors implicated in the network of relationships investigated. For example, Kalleberg and Lincoln (1988), who studied a number of different structural factors considered to be involved in the prediction of earnings, have found that the size of the enterprise, its area of production of goods, the type of tenure offered to employees, the number and characteristics of hierarchical ranks in the workplace organization, and the job evaluation and promotion systems applied, are significantly related to the wages of both male and female workers in manufacturing firms in Japan and the United States. As the review of previous studies in Chapter Four has shown, some of these factors influence the amount and quality of job-related adult education and training received by people in the labour force.

A limitation of the present inquiry is that these factors have not been specified in the models estimated in this monograph. Yet, because the Malmö Study provides access to these and many other variables, in the future interesting possibilities for the development and testing of new ideas and theories in revised models of the recurrent education cycle could be opened up. Also, new advances in statistical theory and measurement can be expected in the future. In this regard, methods involving hierarchical linear modelling and the separation of effects at the between-group and within-group levels of analysis would seem particularly promising for studies incorporating both individual-level and system-level variables (Goldstein, 1987).

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Implications for Policy and Practice

The estimates of the parameters of the path models examined in Chapters Eight and Nine demonstrate, at a general level, that it is not particularly meaningful to ask the question as to whether investment in early formal education brings greater benefits for individual men than investment in adult recurrent education. Both serve a purpose, and both have important effects on life career outcomes. Even though a high level of early formal education increases the probability of a good start in working life, it does not guarantee a prosperous occupational career in the long term. This seems to be the case because the importance of adult education for life career outcomes increases with advancing age relative to the diminishing influence of youth education. For example, the estimates recorded in Figure 9.6 indicate that, at around 40 years of age, the direct effects of youth education and adult education on occupational status are approximately the same. Similarly, the data entered in Figure 9.7 demonstrate that the direct effects of youth education on mid-career earnings are only marginally more important than the effects of adult recurrent education mediated by occupational status measured at 40 and 43 years of age. Nevertheless, the cumulative effects of formal youth education on earnings are the more important of the two throughout the successive stages of life career investigated.

Hence, the main policy issue is not whether more emphasis should be placed on the improvement of youth education or, alternatively, the development of adult recurrent education. That is, the results of this study should not be interpreted as suggesting that either youth education or adult education should get a larger share of the public resources available for investment in education. Such an approach could create a situation of polarization that is clearly contrary to what is needed at the present stage in the on-going development of mass educational systems. Rather, the evidence indicates that youth education and adult education play complementary roles. Furthermore, the effects of youth education and adult education on the life career outcomes of individual men are cumulative. Accordingly, the important policy decision concerns the establishment of an appropriate strategy for the further development of an educational *system* organized around a philosophy of recurrent, lifelong or continuing education.

With regard to the details of such a strategy for the development of

recurrent education, the results of the present investigation can be interpreted as providing a few suggestions, however tentative, concerning the policy measures that are likely to be advantageous. As was mentioned in Chapter Eight, the study provides empirical support for the criticism of recurrent education formulated by Blaug and Mace (1977), who question the value of a policy of postponing a component of upper secondary or initial higher education until a more mature age. The evidence shows that higher levels of early formal education are associated not only with participation in adult education *as such* but, also, with the quality and the duration of the adult education activity. Hence, since participation in adult education is a recurrent and cumulative phenomenon, those who have postponed a part of their formal education until some stage later in their lives and, particularly, those who do not return either to school or university after a long delay, are likely to become relatively disadvantaged in the long term.

As was argued in Chapters Eight and Nine, since both youth education and adult education play an important role in the related processes of status attainment and structural maintenance in society, the disadvantages of a policy of postponement must in the long run be considered to be substantial. If the purpose is to raise the level of formal educational attainment at large in the population, then the most effective way of achieving this would seem to be to offer a high level of general education early in life. Furthermore, the results indicate that it would be advantageous to recruit people to programs of adult education at an as early age as possible, because those who participate in programs of adult education and training early in life more frequently take part in such programs also during later periods of their lives.

Perhaps the most significant contribution of this investigation derives from its implications for the comprehensive theory of recurrent education. According to this theory, the organizing principle for all education should not be the traditional "front-loaded" approach to learning, in which education is confined to a sequence of schooling and higher education early in the lives of people, but should be based on a lifelong view of human development. The results of this study clearly demonstrate that the provision of adult recurrent education produces sizable benefits to men. These benefits are social, economic and psychological. The policy implication is that systematic learning in adult life should be facilitated. Therefore, the results can be interpreted as supporting the desirability of developing a system of recurrent education.

Appendix A.
Supplementary Tables

Supplementary Table A5.1
Descriptions and designations of theoretical and observed variables

Theoretical Variables		Observed Variables Description	Label	Age	N	Mean	S.D.
Home Background	HB	Socioeconomic Status of the Home	SES	9–10	791	2.10	1.00
		Father's Educational Attainment	DADED	9–10	799	2.62	1.21
		Father's Occupational Status	DADJOB	9–10	737	2.36	1.14
		Father's Income (logarithm) *	DADINC	9–10	753	1.33	0.54
Cognitive Ability in Childhood	IQ1	Total Intelligence Test Scores 1938	IQ38	10	834	97.73	16.02
		Subtest 1: Sentence completion	TCOM38	10	834	11.66	5.13
		Subtest 2: Sentence restructuring	TRES38	10	834	11.47	4.97
		Subtest 3: Word opposites	TOPP38	10	834	11.83	5.19
		Subtest 4: Figure perception	TPER38	10	834	11.19	5.73
Home Support for Schooling	HS	Parents' Attitude to their Child's Schooling	PEDATT	*	583	2.89	1.15
Rated Disposition to Learn	TS	Teachers' Ratings of their Students' Aptitude for Learning	TEIQ	10	765	2.89	1.22
		Teachers' Ratings of their Students' Class Standing	TRAT	10	765	2.00	0.52
Youth Education	YE	Years of Formal Education Received	EDUCYR	7–18	603	1.84	0.95
		Level of Formal Education Acquired	ACLEV	7–18	755	2.92	1.34
Cognitive Ability in Early Adulthood	IQ2	Total Intelligence Test Scores 1948	IQ48	20	653	97.58	16.47
		Subtest 1: Concept discrimination	TDIS48	20	551	50.55	9.73
		Subtest 2: Number series	TNUM48	20	551	51.62	9.99
		Subtest 3: Word synonyms	TSYN48	20	551	50.44	9.69
		Subtest 4: Matrices	TMAT48	20	551	49.69	9.88

continued

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Note: * denotes a variable measured in retrospect

Table A5.1 Continued

Interest in Adult Education	MO1	Interest in Adult Education	INTER63	35	486	1.65	0.48
	MO2	Interest in Adult Education	INTER71	43	548	1.69	0.46
Adult Recurrent Education	AE1	Participation (all programs)	ADPAR63	30–35	573	1.48	0.50
		Job-related Adult Education	ADJOB63	30–35	573	2.34	1.58
	AE2	Participation (all programs)	ADPAR71	36–43	571	1.55	0.50
		Job-related Adult Education	ADJOB71	36–43	571	2.56	1.69
		Cumulative General Education	ADCUM71	30–43	537	1.99	0.83
		Cumulative Job-related Education	ACLAD71	30–43	537	1.76	0.86
	AE3	Participation (all programs)	ADPAR84	44–56	556	1.69	0.46
		Job-related Adult Education	ADJOB84	44–56	556	2.92	1.48
		Cumulative General Education	ADCUM84	30–56	563	3.13	1.42
		Cumulative Job-related Education	ACLAD84	30–56	563	2.35	1.23
Occupational Status	OC1	Occupational Status in 1953	OCC53	25	562	3.10	1.08
	OC2	Occupational Status in 1958	OCC58	30	588	3.43	1.30
	OC3	Occupational Status in 1963	OCC63	35	589	3.69	1.34
	OC4	Occupational Status in 1968	OCC68	40	576	3.85	1.40
	OC5	Occupational Status in 1971	OCC71	43	569	3.80	1.37
	OC6	Occupational Status in 1980	OCC80	52	550	3.64	1.43
	OC7	Occupational Status in 1984	OCC84	56	550	3.65	1.47
Earned Income	EA1	Earnings in 1953 (logarithm)	LINC53	25	338	2.18	0.29
	EA2	Earnings in 1958 (logarithm)	LINC58	30	468	2.57	0.31
	EA3	Earnings in 1963 (logarithm)	LINC63	35	644	2.92	0.41
	EA4	Earnings in 1968 (logarithm)	LINC68	40	641	3.46	0.47
	EA5	Earnings in 1971 (logarithm)	LINC71	43	717	3.65	0.48
	EA6	Earnings in 1980 (logarithm)	LINC80	52	696	4.28	0.44
	EA7	Earnings in 1984 (logarithm)	LINC84	56	695	4.62	0.47

continued

Table A5.1 Continued

Job Satisfaction	JS1	Feelings about the Present Job	JFEL63	35	595	3.04	0.87
		Satisfaction with the Career	JSAT63	35	599	3.98	1.10
		Perceived Overall Success in Life	LSUC63	35	594	2.73	0.69
	JS2	Feelings about the Present Job	JFEL71	43	567	3.32	0.79
		Perceived Overall Success in Life	LSUC71	43	567	2.85	0.86
	JS3	Feelings about the Present Job	JFEL84	56	537	3.37	0.79
		Perceived Overall Success in Life	LSUC84	56	549	2.80	0.83
		I Would Recommend Own Job to Friend	JREC84	56	530	3.65	1.13
		I Would Take the Same Job Again	JSAM84	56	538	3.99	1.07
		I Would Rather Look for a New Job	JNEW84	56	531	4.11	1.18
Prospects for Career Development	CP2	Prospects for Future Employment	JPRO71	43	562	3.63	0.91
	CP3	Prospects for Future Employment	JPRO84	56	518	3.65	0.98
		Risk for Becoming Unemployed	JUNP84	56	528	3.44	0.87
Perceived General Well-being	WB	Life is Boring ... Interesting	QBORI	56	535	3.81	1.18
		Life is Empty ... Full	QFULL	56	526	3.81	1.16
		Life is Disappointing ... Rewarding	QDISP	56	530	3.83	1.15
		Life is Useless ... Worthwhile	QUSEL	56	534	3.89	1.16
		Life is Monotonous ... Facinating	QMONO	56	531	3.74	1.21
		Life is Miserable ... Enjoyable	QENJO	56	538	3.95	1.09
		Life is Discouraging ... Hopeful	QHOPE	56	525	3.68	1.16
		Life is Hard ... Easy	QHARD	56	524	3.04	1.37
		Life is Tied-down ... Free	QTIED	56	525	3.68	1.31

Notes: (a) Cell entries under age refer to men born in 1928 only (86 per cent of the population). (b) Subtest scores on the intelligence test given in 1947 and 1949 are not available for 102 men.

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Supplementary Table A5.2
Frequency distributions of ordinal variables used in the study (1=low and 6=high)

	Variable Description	Rank Scale Scores (N) 1	2	3	4	5	6	Total
1	Socioeconomic Status of Home	267	272	160	92			791
2	Father's Educational Attainment	161	194	316	69	31	28	799
3	Father's Occupational Status	207	205	211	81	34		737
4	Parents' Attitude to Schooling	94	137	91	261			583
5	Ratings of Students' Aptitude	129	134	284	128	90		765
6	Ratings of Class Standing	102	561	102				765
7	Years of Formal Education	284	176	99	44			603
8	Level of Formal Education	73	281	195	93	66	47	755
9	Interest in Adult Education age 35	169	317					486
10	Interest in Adult Education age 43	172	376					548
11	Participation all forms, age 30–35	296	277					573
12	Job-related Adult Education, 30–35	385	103	85				573
13	Participation all forms, age 36–43	256	315					571
14	Job-related Adult Education, 36–43	336	152	83				571
15	Cumul. General Education age 30–43	186	168	183				537
16	Cumul. Job-related Education 30–43	289	126	83	39			537
17	Participation all forms, age 44–56	174	382					556
18	Job-related Adult Education, 44–56	244	261	51				556
19	Cumul. General Education age 30–56	128	68	105	128	134		563
20	Cumul. Job-related Education 30–56	210	123	101	81	48		563
21	Occupational Status, age 25	18	133	274	75	36	26	562
22	Occupational Status, age 30	14	111	257	80	65	61	588
23	Occupational Status, age 35	12	95	214	89	100	79	589
24	Occupational Status, age 40	22	83	146	113	131	81	576
25	Occupational Status, age 43	24	86	131	138	119	71	569
26	Occupational Status, age 52	35	105	112	129	108	61	550
27	Occupational Status, age 56	36	106	117	118	103	70	550
28	Feelings About Present Job, age 35	71	66	233	225			595
29	Satisfaction with Career, age 35	37	104	255	203			599
30	Perceived Success in Life, age 35	30	154	359	51			594
31	Feelings About Present Job, age 43	19	57	215	276			567
32	Prospects Future Employment, age 43	18	27	187	246	84		562
33	Perceived Success in Life, age 43	44	126	269	128			567
34	Feelings About Present Job, age 56	19	46	187	285			537
35	Prospects Future Employment, age 56	20	19	195	174	110		518
36	Perceived Success in Life, age 56	39	138	226	106			549
37	Recommend Own Job to Friend, age 56	33	60	83	236	118		530
38	Would Take Same Job Again, age 56	26	29	68	216	199		538
39	Would Look for a New Job, age 56	22	52	56	117	284		531
40	Boring ... Interesting, age 56	25	65	84	172	189		535
41	Empty ... Full, age 56	19	71	83	171	182		526
42	Disappointing ... Rewarding, age 56	29	45	93	182	181		530
43	Useless ... Worthwhile, age 56	24	60	69	181	200		534
44	Monotonous ... Facinating, age 56	36	54	100	163	178		531
45	Miserable ... Enjoyable, age 56	15	51	91	169	212		538
46	Discouraging ... Hopeful, age 56	25	67	115	164	154		525
47	Hard ... Easy, age 56	76	145	91	104	108		524
48	Tied-down ... Free, age 56	48	65	78	148	186		525

Notes: (a) Unweighted and uncompensated measures, Data Set 1. (b) The scales of the nine semantic differentials measuring aspects of well-being (items 40 through 48) have been transformed from seven- to five-category scales.

Supplementary Table A6.1
Selection bias indices (δ) and representation indices (γ) at item level (means $\bar{X}$, effect sizes)

Variable Description	Effects of Nonobservation $\bar{X}$	δ	Representation (observed men) $\bar{X}$	γ
Socioeconomic Status of the Home	94.3	−0.21	97.9	1.01
Father's Occupational Status	93.6	−0.25	98.3	1.03
Parents' Attitude to Child's Schooling	93.0	−0.28	99.8	1.13
Total Intelligence Test Scores, age 10	97.7	0.00	97.7	1.00
Teachers' Ratings of Student Aptitude	99.9	0.13	97.5	0.99
Acquired Level of Formal Education	102.5	0.29	97.2	0.97
Total Intelligence Test Scores, age 20	100.1	0.22	97.1	0.96
Interest in Adult Education, age 35	98.3	0.06	97.3	0.97
Interest in Adult Education, age 43	94.2	−0.21	99.6	1.12
Participation (all forms), age 30–35	93.4	−0.26	99.7	1.13
Participation (all forms), age 36–43	93.7	−0.24	99.6	1.12
Participation (all forms), age 44–56	94.5	−0.19	99.3	1.10
Occupational Status in 1953, age 25	94.2	−0.21	99.4	1.10
Occupational Status in 1958, age 30	93.0	−0.28	99.7	1.13
Occupational Status in 1963, age 35	93.2	−0.27	99.6	1.12
Occupational Status in 1968, age 40	94.1	−0.22	99.4	1.10
Occupational Status in 1971, age 43	93.6	−0.23	99.6	1.12
Occupational Status in 1980, age 52	94.6	−0.19	99.4	1.11
Occupational Status in 1984, age 56	94.6	−0.19	99.4	1.10
Earnings in 1953, age 25	97.2	−0.04	98.1	1.02
Earnings in 1958, age 30	97.5	−0.01	97.9	1.01
Earnings in 1963, age 35	94.3	−0.20	98.7	1.06
Earnings in 1968, age 40	95.6	−0.13	98.4	1.04
Earnings in 1971, age 43	93.9	−0.23	98.5	1.05
Earnings in 1980, age 52	97.2	−0.03	97.8	1.01
Earnings in 1984, age 56	96.4	−0.08	98.0	1.02
Feelings about Present Job, age 35	93.6	−0.25	99.4	1.11
Feelings about Present Job, age 43	93.8	−0.23	99.6	1.12
Feelings about Present Job, age 56	94.1	−0.22	99.7	1.13
Perceived Success in Life, age 35	93.5	−0.26	99.5	1.11
Perceived Success in Life, age 43	94.0	−0.22	99.5	1.12
Perceived Success in Life, age 56	94.6	−0.19	99.4	1.10

Notes: (a) Cognitive ability in childhood (IQ38) is used as the control variable. (b) Selection bias indices with values in the interval from −0.20 to 0.20 are not considered to be significant. (c) Because all representation indices have values in the range from 0.80 to 1.20, the surveyed groups (achieved) do not differ significantly from the master frame population (intended).

Supplementary Table A6.2
Weights and derived weighted mean scores inserted for missing values in variables involved in Data Set 2 (N=744)

Variable Description	Missing Cases N	r	Weight	Observed Group $\bar{X}$	Missing Group $\bar{X}$
Father's Educational Attainment	27	0.24	1.000	2.64	2.64
Father's Occupational Status	84	0.33	0.974	2.73	2.66
Father's Income (logarithm)	67	0.21	1.000	1.32	1.32
Parents' Attitude to Schooling	192	0.31	0.935	2.91	2.72
Ratings of Student Aptitude	61	0.47	1.027	2.94	3.02
Ratings of Class Standing	61	0.65	1.027	1.99	2.04
Years of Formal Education	175	0.41	0.940	1.86	1.75
Level of Formal Education	59	0.56	1.047	3.00	3.14
Intelligence Test Scores, age 20	150	0.75	1.031	98.33	101.38
Subtest 1: Concept Discrimination	237	0.61	0.964	50.85	49.16
Subtest 2: Number Series	237	0.54	0.964	51.98	50.11
Subtest 3: Word Synonyms	237	0.64	0.964	50.69	48.87
Subtest 4: Matrices	237	0.47	0.964	49.98	48.18
Earnings in 1953, age 25	430	0.19[e]	1.016	2.19	2.22
Earnings in 1958, age 30	311	0.30	1.001	2.59	2.59
Earnings in 1963, age 35	141	0.39	0.958	2.93	2.81
Earnings in 1968, age 40	143	0.39	0.982	3.48	3.42
Earnings in 1971, age 43	70	0.41	0.955	3.67	3.50
Earnings in 1980, age 52	62	0.39	1.048	4.28	4.49
Earnings in 1984, age 56	51	0.37	1.057	4.63	4.89
Measures from Questionnaire 1963	183	n.a.	0.946	n.a.	n.a.
Measures from Questionnaire 1971	206	n.a.	0.947	n.a.	n.a.
Measures from Questionnaire 1984	195	n.a.	0.960	n.a.	n.a.

Notes: (a) Cognitive ability in childhood (1Q38) is used as the control variable. (b) Symbol *r* denotes the product moment correlation between the measure and the control variable. (c) A constant questionnaire weight is not applied in cases where the correlation between a measure and the control variable is less than 0.20. Item-specific weights based on the variable grand mean scores are used in these cases (see Kalton, 1983). (d) Missing data are deleted pairwise in the calculation of correlation coefficients. (e) The correlation between cognitive ability at age 10 and earnings at age 25 is 0.19. The correlation between cognitive ability at age 20 and earnings at age 25 is 0.24. (f) Measures derived from a particular questionnaire are weighted all at once, using an identical weight for all measures. Hence, since many measures are involved, it is not feasible to include their mean scores in this table (n.a.).

Supplementary Table A8.1
Summary statistics for the model of the recurrent education cycle (Figure 8.3)
(standardized estimates β, unstandardized estimates B, t-values t)

Parameter:	Path:	β	B	t
Regression of dependent on independent variables:				
γ (1,1)	Youth Education -> Adult Education, Period 1	0.34	0.30	7.90
γ (2,1)	Youth Education -> Adult Education, Period 2	0.34	0.29	7.70
γ (3,1)	Youth Education -> Adult Education, Period 3	0.12	0.10	2.66
Regression of dependent on dependent variables:				
β (2,1)	Adult Education 1 -> Adult Education, Period 2	0.37	0.35	7.12
β (3,1)	Adult Education 1 -> Adult Education, Period 3	*n.a.*	*n.a.*	*n.a.*
β (3,2)	Adult Education 2 -> Adult Education, Period 3	0.49	0.48	8.33
Residual variances in the dependent variables:				
ζ (1,1)	Residual in Adult Education, Period 1	0.88	0.68	9.18
ζ (2,2)	Residual in Adult Education, Period 2	0.66	0.46	9.22
ζ (3,3)	Residual in Adult Education, Period 3	0.64	0.42	9.38
Correlated residuals among dependent variables:				
Ψ (3,1)	Adult Education 1 <-> Adult Education 3	0.16	0.11	3.55
Measurement errors in the dependent variables:				
ε (1,1)	Participation (all programs) Period 1, ADPAR63		0.23	3.72
ε (2,2)	Job-related Adult Education Period 1, ADJOB63		0.48	9.84
ε (3,3)	Participation (all programs) Period 2, ADPAR71		0.31	6.75
ε (4,4)	Job-related Adult Education Period 2, ADJOB71		0.41	9.69
ε (5,5)	Participation (all programs) Period 3, ADPAR84		0.34	6.81
ε (6,6)	Job-related Adult Education Period 3, ADJOB84		0.28	5.42
Measurement errors in independent variables:				
δ (1,1)	Level of Formal Education, ACLEV		0.00	-0.01
δ (2,2)	Years of Formal Education, EDUCYR		0.32	8.04
Significant error covariance terms among dependent variables:				
ε (4,2)	Job-related AE2 <-> Job-related AE1		0.11	5.02
ε (5,3)	Participation AE3 <-> Participation AE2		0.12	4.18
ε (6,4)	Job-related AE3 <-> Job-related AE2		0.08	3.05

Notes: (a) Significance level for $t \geq 2.0$ (b) The measurement error in level of formal education (ACLEV) is not significant. (c) All other estimates recorded in the table are significant.

Supplementary Table A9.1
Comparison of parameter estimates (B) and t-values (t) in measurement models for Model 1953 (age 25) and Model 1984 (age 56)

Parameter (* = fixed)	Path:	Model 1953 B	Model 1953 t	Model 1984 B	Model 1984 t
Factor loadings, common to both models:					
x (1,1)	Home Background -> Father's Occupation *	0.87	*	0.88	*
x (2,1)	Home Background -> Father's Education	0.76	15.2	0.75	15.2
x (3,1)	Home Background -> Father's Income	0.64	19.5	0.65	19.3
x (4,2)	Ability at age 10 -> Sentence Completion *	0.76	*	0.76	*
x (5,2)	Ability at age 10 -> Sentence Structuring	0.72	19.4	0.71	19.4
x (6,2)	Ability at age 10 -> Word Opposites	0.73	17.4	0.74	17.4
x (7,2)	Ability at age 10 -> Figure Perception	0.62	14.7	0.63	14.7
x (8,3)	Youth Education -> Level of Education *	1.00	*	1.00	*
x (9,4)	Ability at age 20 -> Word Discrimination *	0.86	*	0.86	*
x (10,4)	Ability at age 20 -> Number Series	0.82	27.9	0.82	27.9
x (11,4)	Ability at age 20 -> Word Synonyms	0.80	24.0	0.81	24.1
x (12,4)	Ability at age 20 -> Number Matrices	0.72	19.3	0.73	19.4
Measurement error covariances, common to both models:					
e (12,11)	Number Matrices <-> Word Synonyms	0.10	4.6	0.09	4.3
e (12,9)	Number Matrices <-> Word Discrimination	-0.06	-3.7	-0.07	-4.0
e (10,9)	Number Series <-> Word Discrimination	0.05	2.6	0.05	2.7
e (10,5)	Number Series <-> Sentence Restructuring	0.05	2.9	0.05	3.0
e (9,7)	Word Discrimination <-> Figure Perception	-0.06	-3.1	-0.06	-3.1
e (9,4)	Word Discrimination <-> Sentence Completion	0.04	2.5	0.04	2.4
e (7,6)	Figure Perception <-> Word Opposites	-0.09	-3.5	-0.09	-3.5
e (7,2)	Figure Perception <-> Father's Education	-0.06	-2.6	-0.06	-2.5
e (5,4)	Sentence Structure <-> Sentence Completion	0.07	3.1	0.07	3.1
e (3,1)	Father's Income <-> Father's Occupation	0.15	3.9	0.14	3.7
Structural differences: Model of status attainment at age 25					
e (14,6)	Earned Income -> Earnings at age 25 *	0.94	*		
e (14,14)	Error in Earnings at age 25 *	0.10	*		
e (14,3)	Earnings at age 25 <-> Father's Income	0.12	5.0		

Notes: (a) It can be seen that the measurement models are nearly identical. The parameter estimates are strikingly similar, as would be expected. (b) Maximum likelihood, unstandardized solution. (c) The error covariance terms between father's income, on the one hand, and earnings at age 25, 30, 35 and 40, on the other hand, are significant. However, with the exception of Figure 9.2, these covariances are not shown in the path diagrams. (d) Because the reliability of earnings measures could not be estimated from the data, 10 per cent measurement error is assumed. (e) Standard errors and t-values cannot be computed for fixed parameters (*).

Supplementary Table A9.2
Path coefficients (B) and t-values (t) in modified models of status attainment at age 25 (Model 1953, maximum likelihood, unstandardized solution)

Parameter:	Path:	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.31	7.2
β (3,1)	Home Background -> Youth Education	0.44	12.1	0.52	11.2	0.52	11.0
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.04	1.4	*	n.a.
β (5,1)	Home Background -> Occupation Age 25	0.08	1.9	0.10	2.1	0.12	2.4
β (6,1)	Home Background -> Earnings Age 25	0.05	1.2	0.01	0.6	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.54	10.8	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.5	0.75	15.7	0.80	15.6
β (5,2)	Ability Childhood -> Occupation age 25	−0.24	−1.8	−0.22	−1.5	*	n.a.
β (6,2)	Ability Childhood -> Earnings age 25	0.12	0.8	0.13	0.9	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.26	7.6	0.28	9.9
β (5,3)	Youth Education -> Occupation age 25	0.39	7.2	0.37	5.9	0.40	7.5
β (6,3)	Youth Education -> Earnings age 25	0.05	0.8	0.07	1.2	*	n.a.
β (5,4)	Ability Adulthood -> Occupation age 25	0.45	3.0	0.43	2.6	0.22	3.8
β (6,4)	Ability Adulthood -> Earnings age 25	−0.11	−0.7	−0.12	−0.9	*	n.a.
β (6,5)	Occupation Age 25 -> Earnings age 25	0.47	10.7	0.47	10.6	0.49	14.9
Chi-square		213.1		53.3		61.6	
Degrees of Freedom		65		54		60	
Probability		0.00		0.50		0.42	
Goodness of Fit Index		0.96		0.99		0.99	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.3

Path coefficients (B) and t-values (t) in modified models of status attainment at age 30 (Model 1958, maximum likelihood, unstandardized solution)

Parameter	Path	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.30	6.9	0.31	7.3
β (3,1)	Home Background -> Youth Education	0.44	12.1	0.52	11.2	0.52	11.0
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.4	*	n.a.
β (5,1)	Home Background -> Occupation Age 30	0.09	2.4	0.12	2.5	0.13	2.8
β (6,1)	Home Background -> Earnings Age 30	0.04	1.1	0.03	0.6	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.7	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.80	16.0	0.80	15.6
β (5,2)	Ability Childhood -> Occupation age 30	-0.21	-1.6	-0.21	-1.3	*	n.a.
β (6,2)	Ability Childhood -> Earnings age 30	0.17	1.4	0.12	0.8	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.25	7.6	0.28	9.9
β (5,3)	Youth Education -> Occupation age 30	0.46	9.0	0.43	7.6	0.46	9.2
β (6,3)	Youth Education -> Earnings age 30	0.12	2.3	0.11	2.0	0.11	3.1
β (5,4)	Ability Adulthood -> Occupation age 30	0.41	3.0	0.42	2.5	0.22	4.1
β (6,4)	Ability Adulthood -> Earnings age 30	-0.18	-1.3	-0.11	-0.6	*	n.a.
β (6,5)	Occupation Age 30 -> Earnings age 30	0.61	15.4	0.60	15.1	0.60	16.0
Chi-square		213.8		63.0		68.0	
Degrees of Freedom		65		53		58	
Probability		0.00		0.16		0.17	
Goodness of Fit Index		0.96		0.99		0.99	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.4

Path coefficients (B) and t-values (t) in modified models of status attainment at age 35 (Model 1963, maximum likelihood, unstandardized solution)

Parameter:	Path:	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.31	7.3
β (3,1)	Home Background -> Youth Education	0.44	12.1	0.52	11.2	0.52	11.0
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.3	*	n.a.
β (5,1)	Home Background -> Adult Education	0.05	1.0	0.04	0.7	*	n.a.
β (6,1)	Home Background -> Occupation age 35	0.10	2.6	0.12	2.5	0.13	2.8
β (7,1)	Home Background -> Earnings age 35	0.12	3.2	0.14	3.1	0.14	3.0
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.8	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.80	15.7	0.80	15.7
β (5,2)	Ability Childhood -> Adult Education	0.01	0.6	0.07	0.4	*	n.a.
β (6,2)	Ability Childhood -> Occupation age 35	−0.16	−1.3	−0.15	−1.0	*	n.a.
β (7,2)	Ability Childhood -> Earnings age 35	0.10	0.9	0.16	1.1	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.4	0.26	7.7	0.28	9.9
β (5,3)	Youth Education -> Adult Education	0.23	3.7	0.24	3.5	0.30	8.1
β (6,3)	Youth Education -> Occupation age 35	0.45	9.0	0.43	7.8	0.45	9.1
β (7,3)	Youth Education -> Earnings age 35	0.15	3.0	0.15	2.9	0.12	2.4
β (5,4)	Ability Adulthood -> Adult Education	0.06	0.4	0.02	0.1	*	n.a.
β (6,4)	Ability Adulthood -> Occupation age 35	0.35	2.6	0.36	2.2	0.21	4.0
β (7,4)	Ability Adulthood -> Earnings age 35	0.01	0.1	−0.03	−0.2	0.12	2.3
β (6,5)	Adult Education -> Occupation age 35	0.13	3.1	0.13	3.1	0.13	3.1
β (7,5)	Adult Education -> Earnings age 35	−0.08	−2.0	−0.08	−1.9	*	n.a.
β 7,6)	Occupation age 35 -> Earnings age 35	0.51	13.1	0.50	12.7	0.48	12.6
Chi-square		246.9		85.8		95.8	
Degrees of Freedom		86		73		80	
Probability		0.00		0.15		0.11	
Goodness of Fit Index		0.96		0.98		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.5

Path coefficients (B) and t-values (t) in modified models of status attainment at age 40 (Model 1968, maximum likelihood, unstandardized solution)

Parameter:	Path:	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.30	7.2
β (3,1)	Home Background -> Youth Education	0.44	12.0	0.51	11.1	0.51	10.9
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.4	*	n.a.
β (5,1)	Home Background -> Adult Education	0.05	1.1	0.05	0.8	*	n.a.
β (6,1)	Home Background -> Occupation age 40	0.14	3.6	0.16	3.4	0.18	3.8
β (7,1)	Home Background -> Earnings age 40	0.04	1.0	0.03	0.8	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.8	0.55	10.7
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.80	15.6	0.80	15.6
β (5,2)	Ability Childhood -> Adult Education	0.01	0.0	0.00	0.0	*	n.a.
β (6,2)	Ability Childhood -> Occupation age 40	−0.20	−1.6	−0.23	−1.5	*	n.a.
β (7,2)	Ability Childhood -> Earnings age 40	0.07	0.6	0.11	0.7	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.25	7.7	0.28	9.9
β (5,3)	Youth Education -> Adult Education	0.23	3.7	0.22	3.3	0.29	8.1
β (6,3)	Youth Education -> Occupation age 40	0.38	7.5	0.35	6.2	0.39	7.6
β (7,3)	Youth Education -> Earnings age 40	0.26	5.4	0.27	5.1	0.28	7.9
β (5,4)	Ability Adulthood -> Adult Education	0.07	0.4	0.08	0.4	*	n.a.
β (6,4)	Ability Adulthood -> Occupation age 40	0.39	2.8	0.42	2.5	0.20	3.7
β (7,4)	Ability Adulthood -> Earnings age 40	−0.06	−0.4	−0.08	−0.5	*	n.a.
β (6,5)	Adult Education -> Occupation age 40	0.20	4.7	0.20	4.6	0.21	4.7
β (7,5)	Adult Education -> Earnings age 40	−0.02	−0.5	−0.02	−0.4	*	n.a.
β (7,6)	Occupation age 40 -> Earnings age 40	0.52	13.4	0.51	13.2	0.51	14.5
Chi-square		237.9		87.4		95.7	
Degrees of Freedom		86		74		83	
Probability		0.00		0.14		0.16	
Goodness of Fit Index		0.96		0.98		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.6

Path coefficients (B) and t-values (t) in modified models of status attainment at age 43 (Model 1971, maximum likelihood, unstandardized solution)

Parameter:	Path:	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.30	7.2
β (3,1)	Home Background -> Youth Education	0.44	12.1	0.52	11.2	0.51	11.0
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.4	*	n.a.
β (5,1)	Home Background -> Adult Education	0.02	0.5	0.00	0.5	*	n.a.
β (6,1)	Home Background -> Occupation age 43	0.14	3.7	0.17	3.6	0.18	4.0
β (7,1)	Home Background -> Earnings age 43	0.07	2.0	0.08	1.9	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.8	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.80	15.7	0.80	15.6
β (5,2)	Ability Childhood -> Adult Education	−0.13	−0.9	−0.17	−1.0	*	n.a.
β (6,2)	Ability Childhood -> Occupation age 43	−0.23	−1.9	−0.28	−1.8	*	n.a.
β (7,2)	Ability Childhood -> Earnings age 43	0.03	0.3	0.06	0.5	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.25	7.7	0.28	9.9
β (5,3)	Youth Education -> Adult Education	0.27	4.6	0.26	4.0	0.30	5.8
β (6,3)	Youth Education -> Occupation age 43	0.34	6.7	0.31	5.5	0.34	6.9
β (7,3)	Youth Education -> Earnings age 43	0.19	4.2	0.19	3.8	0.23	6.7
β (5,4)	Ability Adulthood -> Adult Education	0.30	1.9	0.34	1.8	0.18	2.9
β (6,4)	Ability Adulthood -> Occupation age 43	0.38	2.8	0.42	2.5	0.15	2.8
β (7,4)	Ability Adulthood -> Earnings age 43	0.02	0.1	−0.01	−0.1	*	n.a.
β (6,5)	Adult Education -> Occupation age 43	0.31	6.1	0.31	6.1	0.32	6.5
β (7,5)	Adult Education -> Earnings age 43	−0.07	−1.4	−0.06	−1.4	*	n.a.
β (7,6)	Occupation age 43 -> Earnings age 43	0.58	15.0	0.58	14.7	0.58	17.0
Chi-square		207.1		75.6		90.1	
Degrees of Freedom		86		76		84	
Probability		0.00		0.49		0.30	
Goodness of Fit Index		0.96		0.99		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.7

Path coefficients (B) and t-values (t) in modified models of status attainment at age 52 (Model 1980, maximum likelihood, unstandardized solution)

Parameter:	Path:	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.30	7.2
β (3,1)	Home Background -> Youth Education	0.43	12.0	0.51	11.0	0.51	10.9
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.4	*	n.a.
β (5,1)	Home Background -> Adult Education	0.07	1.6	0.09	1.6	*	n.a.
β (6,1)	Home Background -> Occupation age 52	0.09	2.6	0.10	2.3	0.13	3.0
β (7,1)	Home Background -> Earnings age 52	0.02	0.4	−0.00	−0.1	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.8	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.79	15.7	0.80	15.6
β (5,2)	Ability Childhood -> Adult Education	−0.07	−0.4	−0.03	−0.2	*	n.a.
β (6,2)	Ability Childhood -> Occupation age 52	−0.20	−1.7	−0.25	−1.7	*	n.a.
β (7,2)	Ability Childhood -> Earnings age 52	0.35	2.4	0.37	2.0	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.25	7.7	0.28	9.9
β (5,3)	Youth Education -> Adult Education	0.19	3.1	0.17	2.8	0.22	4.1
β (6,3)	Youth Education -> Occupation age 52	0.33	7.0	0.37	6.9	0.34	7.3
β (7,3)	Youth Education -> Earnings age 52	0.11	2.1	0.12	2.2	0.10	2.8
β (5,4)	Ability Adulthood -> Adult Education	0.33	2.0	0.36	1.9	0.29	4.4
β (6,4)	Ability Adulthood -> Occupation age 52	0.31	2.4	0.36	2.3	0.12	2.2
β (7,4)	Ability Adulthood -> Earnings age 52	−0.28	−2.0	−0.31	−1.8	*	n.a.
β (6,5)	Adult Education -> Occupation age 52	0.42	9.0	0.37	8.9	0.43	9.2
β (7,5)	Adult Education -> Earnings age 52	−0.04	−0.8	−0.02	−0.5	*	n.a.
β (7,6)	Occupation age 52 -> Earnings age 52	0.65	14.3	0.64	14.3	0.61	16.6
Chi-square		214.0		82.7		98.9	
Degrees of Freedom		86		76		84	
Probability		0.00		0.28		0.13	
Goodness of Fit Index		0.96		0.99		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A9.8

Path coefficients (B) and t-values (t) in modified models of status attainment at age 56 (Model 1984, maximum likelihood, unstandardized solution)

Parameter	Path	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (2,1)	Home Background -> Ability Childhood	0.26	7.0	0.29	6.9	0.30	7.3
β (3,1)	Home Background -> Youth Education	0.43	12.0	0.51	11.0	0.51	10.9
β (4,1)	Home Background -> Ability Adulthood	0.05	1.7	0.05	1.4	*	n.a.
β (5,1)	Home Background -> Adult Education	0.07	1.6	0.06	1.0	*	n.a.
β (6,1)	Home Background -> Occupation age 56	0.09	2.5	0.11	2.5	0.13	2.9
β (7,1)	Home Background -> Earnings age 56	−0.02	−0.5	−0.03	−0.5	*	n.a.
β (3,2)	Ability Childhood -> Youth Education	0.55	11.8	0.55	10.8	0.55	10.6
β (4,2)	Ability Childhood -> Ability Adulthood	0.75	16.4	0.80	15.7	0.80	15.6
β (5,2)	Ability Childhood -> Adult Education	−0.06	−0.4	−0.09	−0.5	*	n.a.
β (6,2)	Ability Childhood -> Occupation age 56	−0.22	−1.9	−0.24	−1.7	*	n.a.
β (7,2)	Ability Childhood -> Earnings age 56	0.27	2.0	0.31	1.9	*	n.a.
β (4,3)	Youth Education -> Ability Adulthood	0.26	8.5	0.26	7.7	0.28	9.9
β (5,3)	Youth Education -> Adult Education	0.18	3.0	0.17	2.6	0.22	4.1
β (6,3)	Youth Education -> Occupation age 56	0.31	6.5	0.29	5.4	0.32	6.8
β (7,3)	Youth Education -> Earnings age 56	0.10	1.8	0.11	1.9	0.08	2.1
β (5,4)	Ability Adulthood -> Adult Education	0.33	2.0	0.38	2.0	0.29	4.4
β (6,4)	Ability Adulthood -> Occupation age 56	0.36	2.8	0.38	2.4	0.14	2.8
β (7,4)	Ability Adulthood -> Earnings age 56	−0.23	−1.5	−0.27	−1.5	*	n.a.
β (6,5)	Adult Education -> Occupation age 56	0.43	9.3	0.43	9.2	0.44	9.4
β (7,5)	Adult Education -> Earnings age 56	−0.06	−1.3	−0.07	−1.3	*	n.a.
β (7,6)	Occupation age 56 -> Earnings age 56	0.58	11.9	0.58	11.8	0.59	15.2
Chi-square		213.2		82.3		96.4	
Degrees of Freedom		86		76		84	
Probability		0.00		0.29		0.17	
Goodness of Fit Index		0.96		0.99		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A10.1
Product moment correlations between response styles and measures of career prospects, job satisfaction and general well-being

	Variable Description	Yeasaying	Naysaying
Measures of career prospects at age 56:			
1	Prospects for Future Employment	−0.05	−0.07
2	Risk for Becoming Unemployed	−0.01	0.01
3	Perceived Success in Life	−0.06	−0.05
Measures of job satisfaction at age 56:			
4	Feelings about the Present Job	−0.04	0.07
5	I Would Recommend Own Job to Friend	−0.04	0.30 **
6	I Would Take the Same Job Again	−0.07	0.25 **
7	I Would Rather Look for a New Job	0.22 **	−0.11 *
Measures of general well-being at age 56:			
8	Life is Boring ... Interesting	−0.06	0.00
9	Life is Empty ... Full	−0.07	0.01
10	Life is Disappointing ... Rewarding	−0.03	−0.04
11	Life is Useless ... Worthwhile	−0.01	0.01
12	Life is Monotonous ... Facinating	−0.07	0.02
13	Life is Miserable ... Enjoyable	−0.05	0.05
14	Life is Discouraging ... Hopeful	−0.08	−0.02
15	Life is Hard ... Easy	−0.09 **	0.08 *
16	Life is Tied-down ... Free	−0.05	0.01

Notes: (a) Data Set 1. (b) 514<N<523. (c) Yeasaying refers to the tendency to agree with a question regardless of its content. (d) Naysaying refers to the tendency to disagree with a question irrespective of its content. (e) Variables denoted with an asterisk are statistically significant at the five per cent (* $p<.05$) and one per cent (** $p<.01$) levels.

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Supplementary Table A10.2
Variances, loadings and weights of measures associated with indices of job satisfaction and general well-being

Variable Description	Variance	Loading	Weight
Measures of job satisfaction at age 56:			
1 Feelings about the Present Job	0.49	0.63	1.66
2 I Would Recommend Own Job to a Friend	1.00	0.69	1.92
3 I Would Take the Same Job Again	0.91	0.91	5.65
4 I Would Rather Look for a New Job	1.10	0.72	2.04
Measures of general well-being at age 56:			
1 Life is Boring ... Interesting	1.09	0.83	3.24
2 Life is Empty ... Full	1.03	0.82	3.01
3 Life is Disappointing ... Rewarding	1.15	0.81	2.84
4 Life is Useless ... Worthwhile	1.06	0.83	3.29
5 Life is Monotonous ... Facinating	1.03	0.86	3.82
6 Life is Miserable ... Enjoyable	1.08	0.73	2.15
7 Life is Discouraging ... Hopeful	1.04	0.82	3.07
Mean of the unweighted index of job satisfaction			3.78
Standard deviation of the index of job satisfaction			0.75
Skewness of the index of job satisfaction			−1.20
Mean of the unweighted index of general well-being			3.79
Standard deviation of the index of general well-being			0.87
Skewness of the index of general well-being			−0.70

Note: Raw scores on the unweighted composite indices are standardized to zero means and one standard deviation.

Supplementary Table A10.3

Path coefficients (B) and t-values (t) in the model of general well-being at age 56 (maximum likelihood, unstandardized solution)

Parameter	Path	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
γ (1,1)	Youth Education -> Ability Adulthood	0.61	21.2	0.62	21.0	0.62	21.0
γ (2,1)	Youth Education -> Adult Education	0.22	4.2	0.21	3.9	0.21	3.9
γ (3,1)	Youth Education -> Occupation age 56	0.37	8.9	0.37	8.7	0.37	8.7
γ (4,1)	Youth Education -> Earnings age 56	0.07	1.4	0.07	1.4	0.08	2.1
γ (5,1)	Youth Education -> Career Prospects	-0.01	-0.1	-0.01	-0.1	*	n.a.
γ (6,1)	Youth Education -> Job Satisfaction	-0.05	-0.9	-0.05	-0.9	*	n.a.
γ (7,1)	Youth Education -> General Well-being	-0.01	-0.2	-0.01	-0.1	*	n.a.
β (2,1)	Ability Adulthood -> Adult Education	0.28	4.3	0.30	4.4	0.30	4.3
β (3,1)	Ability Adulthood -> Occupation age 56	0.16	3.1	0.17	3.1	0.17	3.2
β (4,1)	Ability Adulthood -> Earnings age 56	0.02	0.3	0.02	0.3	*	n.a.
β (5,1)	Ability Adulthood -> Career Prospects	-0.21	-2.9	-0.20	-2.6	-0.20	-3.3
β (6,1)	Ability Adulthood -> Job Satisfaction	0.03	0.5	0.05	0.7	*	n.a.
β (7,1)	Ability Adulthood -> Well-being	-0.06	-1.0	-0.06	-1.0	*	n.a.
β (3,2)	Adult Education -> Occupation age 56	0.44	9.5	0.44	9.4	0.43	9.3
β (4,2)	Adult Education -> Earnings age 56	0.07	1.4	0.07	1.5	*	n.a.
β (5,2)	Adult Education -> Career Prospects	0.06	1.0	0.06	0.9	*	n.a.
β (6,2)	Adult Education -> Job Satisfaction	-0.02	-0.4	-0.04	-0.8	*	n.a.
β (7,2)	Adult Education -> General Well-being	0.08	1.5	0.10	2.1	0.08	2.0
β (4,3)	Occupation age 56 -> Earnings age 56	0.55	11.8	0.55	11.8	0.59	15.3
β (5,3)	Occupation age 56 -> Career Prospects	0.29	4.6	0.29	4.5	0.34	7.2
β (6,3)	Occupation age 56 -> Job Satisfaction	0.12	2.1	0.11	1.8	0.08	2.2
β (7,3)	Occupation age 56 -> Well-being	0.04	0.7	0.02	0.4	*	n.a.
β (5,4)	Earnings age 56 -> Career Prospects	0.04	0.8	0.03	0.7	*	n.a.

continued

Supplementary Table A10.3. Continued

Path coefficients (B) and t-values (t) in the model of general well-being at age 56 (maximum likelihood, unstandardized solution)

Parameter	Path	Stage 1 B	Stage 1 t	Stage 2 B	Stage 2 t	Stage 3 B	Stage 3 t
β (6,4)	Earnings age 56 -> Job Satisfaction	0.01	0.1	0.00	0.1	*	n.a.
β (7,4)	Earnings age 56 -> General Well-being	–0.02	–0.4	–0.02	–0.5	*	n.a.
β (6,5)	Career Prospects -> Job Satisfaction	0.34	9.5	0.46	10.3	0.45	10.5
β (7,5)	Career Prospects -> General Well-being	0.26	7.3	0.30	6.4	0.32	6.8
β (7,6)	Job Satisfaction -> General Well-being	0.25	5.9	0.23	4.3	0.22	4.2
Chi-square		237.2		122.4		129.9	
Degrees of Freedom		111		105		118	
Probability		0.00		0.12		0.22	
Goodness of Fit Index		0.96		0.98		0.98	

Notes: (a) A just-identified and fully recursive model is estimated in stage one, with a sub-diagonally free B matrix and a diagonally free error matrix. (b) The measurement model is modified in stage two. The B matrix remains sub-diagonal while significant error covariance terms are set free. (c) The structural model is modified in the third stage, in which trivial paths with t-values less than two are deleted. (d) An excluded path is indicated with an asterisk. In these cases, t-values are not available (n.a.).

Supplementary Table A10.4
"True" correlations and coefficients of determination (R^2) estimated in the model of general well-being

Dependent Variables	Independent Variables 1	2	3	4	5	6	7	R^2
1 Youth Educational Attainment	1.00							0.4
2 Cognitive Ability at Age 20	0.53							0.27
3 Adult Education, Age 30 to 56	0.44	0.45						0.23
4 Occupational Status at Age 56	0.65	0.59	0.62					0.56
5 Earned Income at Age 56	0.46	0.41	0.40	0.64				0.42
6 Career Prospects at Age 56	0.10	0.04	0.14	0.26	0.16			0.09
7 Job Satisfaction at Age 56	0.11	0.07	0.13	0.22	0.14	0.52		0.28
8 General Well-being at Age 56	0.09	0.06	0.15	0.19	0.12	0.47	0.41	0.27

Notes: (a) The correlations are estimated using the maximum likelihood fit function. Measurement errors and significant error covariance terms are taken into account. (b) The coefficient of determination (R^2) denotes the amount (per cent) of variance explained by explanatory variables in the dependent variable.

Supplementary Table A10.5
Total (TE) and indirect (IE) effects of youth education and adult education on career prospects, job satisfaction and general well-being

Dependent Variables	Youth Education TE	s.e.	IE	s.e.	Adult Education TE	s.e.	IE	s.e.
Career Prospects (CP)	0.10	(0.03)	0.10	(.05)	0.14	(0.03)	0.14	(0.03)
Job Satisfaction (JS)	0.09	(0.03)	0.09	(.03)	0.10	(0.02)	0.10	(0.02)
General Well-being (WB)	0.08	(0.02)	0.08	(.03)	0.14	(0.04)	0.07	(0.01)

Notes: (a) Coefficients are obtained in the LISREL model of general well-being. (b) Standard errors, s.e. (c) Because the total effect coefficient is equal to the sum of direct and indirect effects, the direct effect coefficients can be inferred from the data. (d) Unstandardized maximum likelihood solution.

Appendix B

Input into the LISREL 7 Computer Program

Chapter 7.

Input 7.1. Program for the model of youth educational attainment (Fig. 7.2.)

```
DA NI=12 NO=671 MA=KM
LA
  DADJOB DADED DADINC TOPPSR TCOMSR TPERSR TRESSR PEDATT TEIQ TRAT ACLEV
  EDUCYR /
KM FI=BASE3.KMA
SE
  5 7 4 6 8 9 10 11 1 2 3 /
MO NY=8 NX=3 NE=4 NK=1 BE=FU,FI PS=DI,FR TE=SY,FI TD=SY
LE
  ABILITY HOMESUP DISPOST EDUCTN
LK
  ORIGINS
FR LY(2,1) LY(3,1) LY(4,1) LY(7,3) LX(2,1) LX(3,1)
FR BE(2,1) BE(3,1) BE(4,1) BE(3,2) BE(4,2) BE(4,3)
FI GA(3,1) TE(6,5) TE(8,8)
FR TD(3,1)
VA 1 LY(1,1) LY(5,2) LY(6,3) LY(8,4) LX(1,1)
OU SE SE=ST TV MI ND=3 AD=OFF
```

Chapter 8.

Input 8.1. Program for the model of the recurrent education cycle (Fig. 8.3.)

```
DA NI=15 NO=671 MA=KM
LA
  DADJOB DADED DADINC ACLEV EDUCYR ADPARB1 ADJOB1 ADPART1 ADJOB11 ACLAD11
  ADCUMT1 ADPARB4 ADJOBM4 ACLADM4 ADCUMM4 /
KM FI=CBAUTO.KMA
SE
  6 7 8 9 12 13 14 5 /
MO NY=6 NX=3 NE=3 NK=1 LX=FR,BE,FI,SD TH=ST,FI,SY,FR,SY,FR
LE
  ADULTED1 ADULTED2 ADULTED3
LK
  FOUNDED
FR LY(2,1) LY(4,2) LY(6,3)
FI PS(2,1) PS(3,2) BE(3,1)
FR TE(4,3) TE(5,1) TE(4,2)
VA 1 LY(1,1) LY(5,2) LY(5,3)
OU SE TV EF MI SS ND=3 AD=OFF
```

Input 8.2. Program for the model predicting participation in adult education from age 36 to 43 (Table 8.4.)

```
DA NI=20 NO=671 MA=KM
LA
  SEX !Q38 PEDATT TEIQ ACLEV OCC58 OCC63 LINC58 LINC63 JFEL63 JSAT63 LSUC63
  EDATT63 INTERK63 MUKK63 LEAVE63 ADPAR71 ADJOB71 ACLAD71 /
KM FI=C8PAR71.KMA
SE
  2 3 4 5 7 9 10 14 17 1 /
MO NY=9 NX=1 BE=SD PS=DI
FI GA(7 1) GA(8 1) GA(8 1)
FI BE(7 1) BE(8 1) BE(6 2) BE(6 2) BE(7 2) BE(8 2) BE(9 2) BE(5 3) BE(8 3)
FI BE(8 3) BE(9 3) BE(8 4) BE(8 5) BE(9 7) BE(9 6) BE(8 1) BE(7 3) BE(8 6)
OU SE TV EF SS MI ND=3 AD=OFF
```

Input 8.3. Program for the model predicting participation in adult education from age 44 to 56 (Table 8.5.)

```
DA NI=20 NO=671 MA=KM LA
  SEX !Q38 PEDATT TEIQ ACLEV OCC58 OCC71 LINC58 LINC71 JFEL71 JPRO71 LSUC71
  EDATT71 INTERK71 PRPAY71 LEAVE71 ADPAR84 ADJOB84 ACLADB4 /
KM FI=C8PAR84.KMA
SE
  2 3 4 5 7 9 10 14 17 1 /
MO NY=9 NX=1 BE=SD PS=DI
FI GA(8 1) GA(8 1) GA(7 1) GA(8 1)
FI BE(7 1) BE(8 1) BE(9 2) BE(8 2) BE(6 2) BE(5 2) BE(9 3) BE(8 3) BE(7 3)
FI BE(8 3) BE(5 3) BE(9 4) BE(8 4) BE(7 4) BE(9 6) BE(8 6) BE(6 7) BE(8 7)
FI BE(7 2) BE(8 1) BE(5 1) BE(7 6)
OU SE TV EF SS MI ND=3 AD=OFF
```

Chapter 9.

Input 9.1. Program for the model of status attainment at age 25 (Fig. 9.2.)

```
DA NI=17 NO=821 MA=KM
LA
  DADJOB DADED DADINC TOPPOS TOMJOB TSYJOB TREGOB ACLEV EDUCYR TOGAB TNUMAR
  TSYNAR TMATAB OCC53 OCC58 LINC53 LINC58 /
KM FI=C8INS6.KMA
SE
  1 2 3 5 3 4 6 8 10 11 12 13 14 16 /
MO NY=14 NE=6 BE=FU,FI PS=DI,TE=SY
LE
  ORIGINS !Q 10 YOUTHED !Q 20 OCC53 LINC53
FR LY(2 1) LY(3 1) LY(5 2) LY(6 2) LY(7 2) LY(10 4) LY(11 4) LY(12 4)
FR BE(2 1) BE(3 1) BE(5 1) BE(3 2) BE(4 2) BE(4 3) BE(5 3) BE(5 4) BE(6 5)
FI TE(6 6) TE(7 7) TE(14 14)
FR TE(3 1) TE(4 3) TE(12 11) TE(12 3) TE(12 9) TE(13 6) TE(9 7) TE(9 4)
FR TE(11 6) TE(7 2) TE(5 4)
VA 0 10 TE(14 14)
VA 1 LY(1 1) LY(4 2) LY(8 3) LY(9 4) LY(13 6) LY(14 6)
OU SE TV EF SS MI ND=3 AD=OFF
```

Input 9.2. Program for the model of status attainment at age 30 (Table 9.3.)

```
DA NI=17 NO=671 MA=KM
LA
  DADJOB DADED DADINC TOPP3R TCOM3R TPR3R TRES3R ACLEV EDUCYR TDIS4R TNUM4R
  TSYN4R TMAT4R OCC53 OCC5R LINC53 LINC5R /
KM FI=C3RN6R.KMA
SE
  1 2 3 5 7 4 6 8 10 11 12 13 15 17 /
MO NY=14 NE=6 BE=FU,FI PS=DI,TE=SY
LE
  ORIGINS (Q-10 YOUTHED (Q-20 OCC5R LINC5R
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR BE(2,1) BE(3,1) BE(5,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3) BE(5,4)
FR BE(6,5)
FI TE(8,8) TE(13,13) TE(14,14)
FR TE(3,1) TE(14,12) TE(14,3) TE(12,11) TE(12,9) TE(10,9) TE(10,5) TE(9,7)
FR TE(9,4) TE(7,6) TE(7,2) TE(5,4)
VA 1 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(14,6)
VA 0 TE(14,14)
OU SE TV EF SS MI ND=3 AD=OFF
```

Input 9.3. Program for the model of status attainment at age 35 (Fig. 9.3.)

```
DA NI=19 NO=671 MA=KM
LA
  DADJOB DADED DADINC TOPP3R TCOM3R TPR3R TRES3R ACLEV EDUCYR TDIS4R TNUM4R TSYN
TMAT4R ADPAR6R3 ADJOB6R3 OCC63 OCC6R LINC63 LINC6R /KM FI=C3RN6R.KMA
SE
  1 2 3 5 7 4 6 8 10 11 12 13 14 15 16 18 /
MO NY=16 NE=7 BE=FU,FI PS=DI,TE=SY
LE
  ORIGINS (Q-10 YOUTHED (Q-20 ADJUSTED OCC63 LINC63
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR LY(14,5)
FR BE(2,1) BE(3,1) BE(6,1) BE(7,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3)
FR BE(7,3) BE(6,4) BE(7,4) BE(6,5) BE(7,6)
FI TE(8,8) TE(15,15) TE(16,16)
FR TE(16,3) TE(14,4) TE(14,2) TE(3,1) TE(12,11) TE(12,9) TE(10,9) TE(10,5)
FR TE(9,7) TE(9,4) TE(7,6) TE(7,2) TE(5,4)
VA 0 10 TE(16,16)
VA 1 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(15,6) LY(16,7)
OU SE TV EF SS MI ND=3 AD=OFF
```

Input 9.4. Program for the model of status attainment at age 40 (Table 9.4.)

```
DA NI=19 NO=671 MA=KM
LA
  DADJOB DADED DADINC TOPP3R TCOM3R TPR3R TRES3R ACLEV EDUCYR TDIS4R TNUM4R
  TSYN4R TMAT4R ADPAR6R3 ADJOB6R3 OCC63 OCC6R LINC63 LINC6R /
KM FI=C3RN6R.KMA
SE
  1 2 3 5 7 4 6 8 10 11 12 13 14 15 17 19 /
MO NY=18 NE=7 BE=FU,FI PS=DI,TE=SY
LE
  ORIGINS (Q-10 YOUTHED (Q-20 ADJUSTED OCC6R LINC6R
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR LY(14,5)
```


26(1)

FR BE(2,1) BE(3,1) BE(6,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3) BE(7,3)
FR BE(6,4) BE(6,5) BE(7,6)
FI TE(8,8) TE(15,15) TE(16,16)
FR TF(16,3) TE(3,1) TE(14,2) TE(12,11) TE(12,3) TE(10,9) TE(10,5) TE(9,7)
FR TE(9,4) TE(7,6) TE(7,2) TE(5,4)
VA 6,10 TE(16,16)
VA 1 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(15,6) LY(16,7)
OU SE TV EF SS MI ND=3 AD=OFF

Input 9.5. Program for the model of status attainment at age 43 (Fig. 9.4.)

DA NI=21 NO=671 MA=KM
LA
DADJOB DADED DADINC TOPP38 TCOM38 TPER38 TRES38 ACLEV EDUCYR TDIS48 TNUM48
TSYN48 TMAT48 ADPAR71 ADJOB71 ACLAD71 ADCUM71 OCC71 OCC80 LINC71 LINC80 /
KM FI=C:\9N71.KMA
SE
1,2,3,5,7,4,6,8,10,11,12,13,16,14,18,20 /
MO NY=16 NE=7 BE=FU,FI PS=DI TE=SY
LE
ORIGINS (Q.10 YOUTHED (Q.20 ADULTED OCC71 LINC71)
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR LY(14,5)
FR BE(2,1) BE(3,1) BE(6,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3) BE(7,3)
FR BE(5,4) BE(6,4) BE(6,5) BE(7,6)
FI TE(8,8) TE(15,15) TE(16,16)
FR TE(3,1) TE(12,11) TE(12,3) TE(10,9) TE(10,5) TE(9,7) TE(9,4) TE(7,6)
FR TE(7,2) TE(5,4)
VA 5 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(15,6) LY(16,7)
OU SE TV EF SS MI ND=3 AD=OFF

Input 9.6. Program for the model of status attainment at age 52 (Table 9.5.)

DA NI=21 NO=671 MA=KM
LA
DADJOB DADED DADINC TOPP38 TCOM38 TPER38 TRES38 ACLEV EDUCYR TDIS48 TNUM48
TSYN48 TMAT48 ADPAR84 ADJOB84 ACLAD84 ADCUM84 OCC80 OCC84 LINC80 LINC84 /
KM FI=C:\9N84.KMA
SE
1,2,3,5,7,4,6,8,10,11,12,13,16,14,18,20 /
MO NY=16 NE=7 BE=FU,FI PS=DI TE=SY
LE
ORIGINS (Q.10 YOUTHED (Q.20 ADULTED OCC80 LINC80)
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR LY(14,5)
FR BE(2,1) BE(3,1) BE(6,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3) BE(7,3)
FR BE(5,4) BE(6,4) BE(6,5) BE(7,6)
FI TE(8,8) TE(15,15) TE(16,16)
FR TE(3,1) TE(12,11) TE(12,3) TE(10,9) TE(10,5) TE(9,7) TE(9,4) TE(7,6)
FR TE(7,2) TE(5,4)
VA 1 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(15,6) LY(16,7)
OU SE TV EF SS MI ND=3 AD=OFF

Input 9.7. Program for the model of status attainment at age 56 (Fig. 9.5.)

```
 DA NI=21 NO=671 MA=KM
LA
 DADJOB DADED DADINC TOPP38 TCOM38 TPER38 TRES38 ACLEV EDUCYR TDIS48 TNUM48
 TSYN48 TMAT48 ADPAR84 ADJOB84 ACLAD84 ADGEN84 OCC80 OCC84 LINC80 LINC84 /
KM FI=C9IN84.KMA
SE
 1 2 3 5 7 4 6 8 10 11 12 13 16 14 19 21 /
MO NY=16 NE=7 BE=FU,FI PS=DI TE=SY
LE
 ORIGINS IQ.10 YOUTHED IQ.20 ADULTED OCC84 LINC84
FR LY(2,1) LY(3,1) LY(5,2) LY(6,2) LY(7,2) LY(10,4) LY(11,4) LY(12,4)
FR LY(14,5)
FR BE(2,1) BE(3,1) BE(6,1) BE(3,2) BE(4,2) BE(4,3) BE(5,3) BE(6,3) BE(7,3)
FR BE(5,4) BE(6,4) BE(6,5) BE(7,6)
FI TE(8,8) TE(15,15) TE(16,16)
FR TE(3,1) TE(12,11) TE(12,9) TE(10,9) TE(10,5) TE(9,7) TE(9,4) TE(7,6)
FR TE(7,2) TE(5,4)
VA 1 LY(1,1) LY(4,2) LY(8,3) LY(9,4) LY(13,5) LY(15,6) LY(16,7)
OU SE TV EF SS MI ND=3 AD=OFF
```

Chapter 10.

Input 10.1. Program for the model of well-being at age 56 (Fig. 10.4.)

```
DA NI=28 NO=671 MA=KM
LA
 ACLEV EDUCYR TDIS48 TNUM48 TSYN48 TMAT48 OCC84 LINC84 JFEL84 JREC84 JSAM84
 JNEW84 JPRO84 JUNP84 LSUC84 QBORI84 QENJO84 QUSEL84 QFULL84 QHOPE84 QMONO84
 QDISP84 WBINDEX JSINDEX ADPAR84 ADJOB84 ACLAD84 ADGEN84 /
KM FI=C10M1.KMA
SE
 3 4 5 6 27 25 7 8 13 11 12 10 9 22 16 18 19 1 /
MO NY=17 NX=1 NE=7 NK=1 BE=FU,FI PS=DI PH=ST TE=SY
LE
 IQ48 ADULTED OCC84 LINC84 JGROWTH JOBSAT LIFESAT
LK
 YOUTHED
FR LY(2,1) LY(3,1) LY(4,1) LY(6,2) LY(11,6) LY(12,6) LY(13,6) LY(13,7)
FR LY(15,7) LY(16,7) LY(17,7)
FR BE(2,1) BE(3,1) BE(5,1) BE(3,2) BE(7,2) BE(4,3) BE(5,3) BE(6,3) BE(6,5)
FR BE(7,5) BE(7,6)FI GA(5,1) GA(6,1) GA(7,1)
FI TE(7,7) TE(8,8) TE(9,9) TD(1,1)
FR TE(2,1) TE(4,1) TE(4,3) TE(17,5) TE(10,9) TE(12,10)
VA 1 LY(1,1) LY(5,2) LY(7,3) LY(8,4) LY(9,5) LY(10,6) LY(14,7)
VA 1 LX(1,1)
VA 0.15 TE(9,9)
OU TV SE EF SS MI ND=3 AD=OFF
```

Appendix C

Product Moment Correlation Coefficients

The lower half of the correlation matrix is entered. Read each row up to and including the diagonal element. The product moment correlation coefficients are estimated using the PRELIS 1.7 computer program (Joreskog and Sorbom, 1986) and 60 variables derived from the Malmo Study (Data Set 3, N=671). The rank order of the variables in the matrix is as follows (see Table A5.1 for a key to the mnemonics):

1 DADED	**16** TSYN48	**31** OCC58	**46** JFEL84
2 DADJOB	**17** TMAT48	**32** OCC63	**47** JPRO84
3 SES	**18** INTER63	**33** OCC68	**48** JREC84
4 DADINC	**19** INTER71	**34** OCC71	**49** JSAM84
5 TOPP38	**20** ADPAR63	**35** OCC80	**50** JNEW84
6 TCOM38	**21** ADJOB63	**36** OCC84	**51** LSUC84
7 TPER38	**22** ADPAR71	**37** LINC53	**52** QBORI84
8 TRES38	**23** ADJOB71	**38** LINC58	**53** QENJO84
9 PEDATT	**24** ACLAD71	**39** LINC63	**54** QUSEL84
10 TRAT	**25** ADCUM71	**30** LINC68	**55** QFULL84
11 TEIQ	**26** ADPAR48	**41** LINC71	**56** QHOPE84
12 EDUCYR	**27** ADJOB84	**42** LINC80	**57** QMONO84
13 ACLEV	**28** ACLAD84	**43** LINC84	**58** QDISP84
14 TDIS48	**29** ADCUM84	**44** JFEL63	**59** WBINDEX
15 TNUM48	**30** OCC53	**45** JFEL71	**60** JSINDEX

1.000
0.659 **1.000**
0.617 0.817 **1.000**
0.479 0.712 0.730 **1.000**
0.167 0.250 0.219 0.189 **1.000**
0.165 0.209 0.204 0.153 0.582 **1.000**
0.102 0.215 0.220 0.187 0.375 0.452 **1.000**
0.155 0.201 0.199 0.140 0.509 0.616 0.460 **1.000**
0.295 0.357 0.381 0.249 0.185 0.196 0.167 0.211 **1.000**
0.141 0.223 0.262 0.197 0.382 0.465 0.325 0.431 0.221 **1.000**
0.207 0.289 0.291 0.206 0.494 0.596 0.411 0.545 0.307 0.692
1.000
0.495 0.534 0.521 0.388 0.323 0.328 0.280 0.316 0.439 0.365
0.452 **1.000**
0.451 0.520 0.510 0.395 0.408 0.429 0.360 0.429 0.440 0.410
0.530 0.826 **1.000**
0.298 0.351 0.332 0.249 0.566 0.629 0.423 0.561 0.335 0.421
0.568 0.531 0.625 **1.000**
0.289 0.353 0.349 0.291 0.518 0.551 0.461 0.578 0.328 0.440
0.555 0.518 0.590 0.750 **1.000**
0.249 0.337 0.367 0.256 0.522 0.550 0.474 0.512 0.318 0.424

0.570 0.498 0.591 0.683 0.657 **1.000**
0.196 0.270 0.286 0.225 0.456 0.455 0.426 0.461 0.287 0.368
0.502 0.405 0.528 0.554 0.601 0.682 **1.000**
0.003 0.025 0.010 -0.013 0.057 0.018 -0.022 0.049 -0.026 -0.038
-0.010 -0.067 -0.037 -0.005 -0.030 -0.026 -0.013 **1.000**
0.011 0.071 0.058 0.036 0.090 0.077 0.083 0.125 0.056 0.051
0.052 0.027 0.114 0.077 0.085 0.141 0.188 0.142 **1.000**
0.093 0.181 0.155 0.133 0.137 0.169 0.176 0.139 0.156 0.088
0.187 0.240 0.299 0.221 0.186 0.199 0.204 0.150 0.202 **1.000**
0.057 0.201 0.142 0.131 0.125 0.076 0.163 0.109 0.131 0.093
0.129 0.216 0.259 0.172 0.182 0.163 0.170 0.097 0.137 0.632
1.000
0.146 0.224 0.209 0.160 0.196 0.192 0.204 0.214 0.224 0.168
0.255 0.301 0.370 0.316 0.304 0.285 0.269 0.068 0.310 0.386
0.285 **1.000**
0.134 0.220 0.204 0.165 0.181 0.192 0.162 0.195 0.234 0.198
0.282 0.328 0.390 0.273 0.280 0.265 0.256 0.041 0.237 0.300
0.369 0.631 **1.000**
0.125 0.238 0.204 0.173 0.192 0.192 0.200 0.197 0.230 0.194
0.266 0.334 0.401 0.289 0.294 0.271 0.269 0.083 0.247 0.539
0.704 0.688 0.859 **1.000**
0.143 0.243 0.219 0.176 0.200 0.217 0.226 0.212 0.228 0.155
0.265 0.325 0.402 0.322 0.295 0.291 0.284 0.131 0.307 0.832
0.551 0.833 0.559 0.685 **1.000**
0.099 0.183 0.168 0.147 0.205 0.237 0.207 0.176 0.143 0.136
0.208 0.226 0.275 0.275 0.242 0.262 0.287 0.105 0.255 0.329
0.250 0.525 0.361 0.387 0.513 **1.000**
0.150 0.237 0.212 0.196 0.236 0.220 0.192 0.169 0.127 0.165
0.238 0.260 0.301 0.305 0.248 0.274 0.280 0.081 0.185 0.900
0.289 0.432 0.474 0.490 0.440 0.689 **1.000**
0.158 0.274 0.244 0.215 0.252 0.238 0.220 0.209 0.216 0.211
0.295 0.337 0.406 0.343 0.315 0.319 0.321 0.090 0.253 0.490
0.587 0.607 0.792 0.859 0.659 0.617 0.840 **1.000**
0.130 0.220 0.208 0.171 0.238 0.244 0.240 0.226 0.198 0.167
0.261 0.304 0.363 0.319 0.299 0.309 0.303 0.142 0.321 0.644
0.459 0.773 0.533 0.617 0.851 0.802 0.696 0.707 **1.000**
0.331 0.368 0.361 0.318 0.309 0.270 0.293 0.283 0.294 0.284
0.373 0.575 0.601 0.456 0.453 0.416 0.383 -0.056 0.085 0.246
0.190 0.260 0.268 0.290 0.304 0.248 0.277 0.315 0.309 **1.000**
0.365 0.407 0.386 0.363 0.332 0.295 0.332 0.322 0.327 0.306
0.404 0.617 0.667 0.490 0.491 0.460 0.441 -0.068 0.114 0.258
0.220 0.304 0.304 0.323 0.337 0.261 0.279 0.344 0.324 0.843
1.000
0.359 0.423 0.412 0.376 0.354 0.304 0.329 0.333 0.329 0.313
0.407 0.635 0.685 0.490 0.506 0.464 0.461 -0.022 0.120 0.286
0.268 0.332 0.366 0.394 0.371 0.309 0.363 0.428 0.375 0.767
0.874 **1.000**
0.352 0.447 0.412 0.364 0.323 0.298 0.309 0.323 0.331 0.266
0.360 0.617 0.659 0.457 0.483 0.468 0.462 -0.010 0.153 0.322
0.306 0.357 0.383 0.424 0.408 0.362 0.404 0.473 0.421 0.636
0.712 0.794 **1.000**
0.360 0.447 0.435 0.376 0.322 0.303 0.281 0.313 0.339 0.279

0.348 0.603 0.663 0.470 0.480 0.469 0.467 0.003 0.175 0.312
0.295 0.385 0.428 0.451 0.419 0.386 0.443 0.521 0.442 0.592
0.682 0.749 0.864 **1.000**
0.331 0.430 0.404 0.343 0.344 0.314 0.288 0.297 0.296 0.274
0.370 0.586 0.650 0.470 0.476 0.460 0.474 0.010 0.179 0.331
0.316 0.398 0.447 0.473 0.438 0.414 0.479 0.552 0.473 0.570
0.653 0.717 0.810 0.897 **1.000**
0.324 0.430 0.399 0.331 0.356 0.318 0.294 0.302 0.307 0.282
0.373 0.593 0.647 0.485 0.489 0.464 0.474 -0.002 0.164 0.316
0.321 0.404 0.444 0.472 0.433 0.423 0.494 0.559 0.478 0.570
0.657 0.710 0.793 0.877 0.967 **1.000**
0.174 0.221 0.203 0.304 0.206 0.175 0.159 0.147 0.122 0.150
0.206 0.341 0.341 0.242 0.262 0.239 0.188 -0.008 0.064 0.185
0.131 0.152 0.153 0.175 0.202 0.155 0.181 0.199 0.210 0.503
0.439 0.401 0.299 0.315 0.300 0.297 **1.000**
0.285 0.318 0.298 0.331 0.296 0.245 0.226 0.236 0.248 0.265
0.329 0.466 0.515 0.378 0.363 0.330 0.262 -0.051 0.063 0.181
0.147 0.228 0.257 0.259 0.246 0.232 0.267 0.298 0.267 0.591
0.678 0.634 0.524 0.513 0.509 0.506 0.516 **1.000**
0.355 0.464 0.386 0.400 0.337 0.294 0.302 0.310 0.266 0.304
0.342 0.564 0.593 0.439 0.459 0.401 0.369 -0.069 0.041 0.162
0.183 0.212 0.233 0.259 0.225 0.231 0.269 0.302 0.260 0.560
0.634 0.686 0.625 0.629 0.619 0.611 0.430 0.686 **1.000**
0.315 0.386 0.388 0.369 0.312 0.275 0.272 0.286 0.295 0.272
0.307 0.565 0.614 0.430 0.395 0.406 0.383 -0.058 0.093 0.224
0.239 0.283 0.321 0.346 0.304 0.302 0.337 0.388 0.334 0.550
0.612 0.658 0.697 0.695 0.662 0.660 0.328 0.569 0.772 **1.000**
0.348 0.418 0.390 0.365 0.311 0.265 0.277 0.297 0.281 0.273
0.320 0.558 0.613 0.434 0.432 0.410 0.391 -0.055 0.004 0.202
0.228 0.276 0.303 0.329 0.287 0.302 0.342 0.382 0.329 0.531
0.689 0.627 0.668 0.731 0.696 0.694 0.310 0.532 0.711 0.786
1.000
0.219 0.321 0.296 0.272 0.294 0.297 0.221 0.301 0.226 0.249
0.320 0.466 0.502 0.372 0.362 0.348 0.352 0.011 0.108 0.205
0.213 0.249 0.312 0.328 0.273 0.283 0.318 0.363 0.300 0.434
0.493 0.515 0.579 0.625 0.681 0.664 0.205 0.451 0.571 0.638
0.693 **1.000**
0.289 0.279 0.272 0.225 0.284 0.277 0.218 0.255 0.199 0.247
0.327 0.416 0.463 0.354 0.349 0.330 0.314 -0.010 0.092 0.177
0.187 0.270 0.285 0.298 0.269 0.348 0.376 0.382 0.329 0.417
0.476 0.505 0.524 0.554 0.610 0.643 0.186 0.408 0.519 0.555
0.621 0.716 **1.000**
0.068 0.047 0.045 0.050 -0.005 -0.041 -0.002 -0.003 0.082 -0.004
-0.069 0.048 0.041 -0.051 0.018 -0.038 -0.047 -0.164 -0.018 -0.096
-0.042 -0.076 0.016 -0.015 -0.103 -0.029 -0.005 -0.013 -0.066 0.004
0.074 0.114 0.120 0.147 0.131 0.126 0.066 0.171 0.203 0.126
0.127 0.088 0.074 **1.000**
0.084 0.068 0.072 0.048 0.034 0.064 0.087 0.112 0.125 0.036
0.063 0.085 0.127 0.040 0.083 0.043 0.085 -0.015 0.092 0.033
0.086 0.145 0.176 0.166 0.107 0.113 0.084 0.161 0.131 0.115
0.146 0.163 0.198 0.218 0.213 0.191 0.047 0.166 0.163 0.172
0.192 0.175 0.096 0.231 **1.000**

0.044 0.050 0.021 0.019 0.005 0.029 0.040 0.011 0.078 0.040
0.045 0.075 0.068 0.016 0.044 0.002 0.046 -0.079 0.024 0.050
0.073 0.106 0.062 0.075 0.093 0.130 0.101 0.098 0.121 0.115
0.130 0.136 0.142 0.165 0.168 0.189 0.069 0.118 0.099 0.115
0.133 0.095 0.130 0.189 0.291 **1.000**
0.056 0.072 0.039 0.031 -0.034 -0.041 -0.016 -0.022 0.051 0.003
0.024 0.057 0.094 0.019 0.017 0.008 0.056 0.006 -0.027 0.045
0.109 0.066 0.080 0.099 0.067 0.133 0.148 0.148 0.104 0.153
0.180 0.124 0.149 0.172 0.204 0.242 0.065 0.174 0.109 0.167
0.160 0.117 0.172 0.169 0.189 0.385 **1.000**
0.087 0.061 0.016 0.007 0.009 0.024 -0.027 0.026 0.081 0.046
0.039 0.079 0.052 0.024 0.013 0.004 0.039 -0.042 -0.014 0.005
0.057 0.083 0.053 0.062 0.053 0.086 0.057 0.081 0.069 0.110
0.134 0.094 0.086 0.102 0.117 0.128 0.071 0.114 0.111 0.097
0.109 0.084 0.097 0.109 0.130 0.413 0.290 **1.000**
0.093 0.096 0.067 0.036 -0.003 0.049 0.023 0.058 0.078 0.077
0.074 0.092 0.075 0.049 0.061 0.073 0.078 -0.108 0.013 0.015
0.058 0.079 0.073 0.075 0.056 0.073 0.066 0.091 0.071 0.106
0.121 0.092 0.126 0.166 0.152 0.165 0.050 0.126 0.161 0.153
0.163 0.116 0.111 0.190 0.221 0.544 0.327 0.642 **1.000**
0.081 0.098 0.076 0.070 0.024 0.062 0.003 0.059 0.082 0.084
0.096 0.097 0.074 0.062 0.065 0.066 0.048 -0.033 0.027 0.007
0.057 0.091 0.057 0.065 0.059 0.073 0.087 0.086 0.076 0.121
0.137 0.108 0.132 0.146 0.182 0.191 0.081 0.115 0.148 0.136
0.149 0.130 0.132 0.137 0.220 0.511 0.359 0.456 0.645 **1.000**
0.090 0.112 0.111 0.060 0.030 0.015 0.044 0.012 0.035 0.079
0.076 0.131 0.138 0.040 0.053 0.059 0.060 -0.030 0.032 0.038
0.068 0.080 0.109 0.106 0.071 0.109 0.172 0.160 0.091 0.189
0.186 0.203 0.255 0.268 0.285 0.318 0.082 0.207 0.246 0.274
0.251 0.207 0.256 0.228 0.227 0.412 0.525 0.289 0.382 0.372
1.000
0.074 0.075 0.049 0.025 -0.027 -0.035 0.014 -0.032 0.029 0.089
0.022 0.122 0.087 0.031 0.024 0.052 0.035 -0.068 0.014 0.059
0.097 0.099 0.137 0.139 0.095 0.125 0.142 0.164 0.118 0.156
0.144 0.154 0.172 0.189 0.184 0.205 0.079 0.146 0.166 0.150
0.160 0.122 0.137 0.154 0.188 0.373 0.368 0.261 0.341 0.253
0.425 **1.000**
-0.016 -0.009 -0.043 -0.008 -0.034 -0.046 0.030 -0.028 0.002 0.001
0.017 -0.013 -0.008 -0.013 0.012 -0.013 0.013 -0.045 0.012 0.031
0.046 0.029 0.025 0.036 0.036 0.065 0.066 0.050 0.060 0.086
0.073 0.061 0.052 0.059 0.061 0.073 0.025 0.088 0.043 0.044
0.076 0.034 0.076 0.090 0.175 0.413 0.311 0.195 0.286 0.246
0.274 0.611 **1.000**
0.044 0.069 0.025 0.045 0.032 -0.006 0.015 0.027 0.028 0.055
0.037 0.024 0.050 0.029 0.007 0.025 0.089 -0.004 0.035 0.043
0.090 0.044 0.091 0.107 0.052 0.125 0.149 0.150 0.103 0.078
0.051 0.071 0.089 0.103 0.126 0.146 -0.003 0.095 0.093 0.084
0.096 0.076 0.069 0.115 0.204 0.384 0.358 0.217 0.261 0.231
0.320 0.620 0.641 **1.000**
0.010 0.026 -0.001 0.009 -0.005 -0.013 0.027 0.026 0.064 0.019
0.030 0.037 0.047 0.043 0.038 0.034 0.070 -0.035 0.049 0.020
0.032 0.057 0.050 0.047 0.046 0.131 0.089 0.076 0.099 0.106

0.090 0.088 0.093 0.101 0.114 0.120 0.039 0.108 0.114 0.089
0.110 0.079 0.106 0.152 0.182 0.348 0.311 0.206 0.259 0.206
0.320 0.626 0.695 0.728 **1.000**
0.023 0.029 -0.009 0.002 -0.046 -0.110 -0.048 -0.072 -0.016 -0.062
-0.022 0.002 -0.018 -0.050 -0.062 -0.020 -0.010 -0.008 -0.032 -0.032
0.021 0.029 0.023 0.023 -0.002 0.046 0.091 0.068 0.022 0.063
0.054 0.066 0.055 0.084 0.087 0.104 0.001 0.090 0.078 0.064
0.054 0.041 0.035 0.143 0.184 0.371 0.410 0.213 0.317 0.258
0.385 0.650 0.584 0.667 0.636 **1.000**
0.009 -0.001 -0.008 -0.026 -0.026 -0.035 0.002 -0.020 -0.006 0.029
0.009 0.049 0.054 0.028 0.014 0.027 0.026 -0.007 0.020 0.037
0.074 0.089 0.101 0.102 0.076 0.085 0.119 0.121 0.086 0.129
0.103 0.105 0.082 0.126 0.135 0.144 0.062 0.117 0.130 0.106
0.121 0.095 0.101 0.158 0.178 0.353 0.332 0.213 0.309 0.224
0.343 0.691 0.570 0.637 0.654 0.636 **1.000**
0.032 0.032 0.014 0.001 -0.052 -0.059 -0.036 -0.049 0.029 -0.006
0.033 0.016 0.011 -0.018 -0.020 -0.001 -0.002 -0.043 -0.011 -0.017
0.042 0.042 0.054 0.053 0.015 0.077 0.101 0.086 0.041 0.098
0.077 0.081 0.072 0.091 0.103 0.114 0.003 0.078 0.087 0.085
0.061 0.085 0.070 0.101 0.155 0.328 0.388 0.242 0.309 0.270
0.422 0.714 0.606 0.659 0.623 0.743 0.672 **1.000**
0.035 0.043 0.012 0.010 -0.035 -0.065 -0.011 -0.035 0.009 0.003
0.008 0.050 0.042 0.003 -0.006 0.013 0.027 -0.040 0.001 0.019
0.067 0.066 0.082 0.085 0.051 0.101 0.126 0.121 0.081 0.118
0.100 0.104 0.105 0.132 0.140 0.155 0.041 0.128 0.132 0.107
0.119 0.090 0.097 0.172 0.214 0.423 0.416 0.262 0.356 0.277
0.428 0.861 0.764 0.831 0.835 0.842 0.845 0.823 **1.000**
0.101 0.099 0.065 0.041 0.001 0.047 0.011 0.049 0.094 0.078
0.076 0.105 0.081 0.050 0.058 0.056 0.064 -0.006 0.005 0.010
0.066 0.097 0.075 0.079 0.065 0.084 0.078 0.098 0.080 0.127
0.149 0.115 0.138 0.173 0.176 0.190 0.074 0.144 0.170 0.159
0.171 0.128 0.129 0.200 0.245 0.654 0.390 0.754 0.956 0.779
0.433 0.369 0.304 0.287 0.275 0.341 0.327 0.343 0.384 **1.000**

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ISBN 91-22-01317-2